HAMPDEN COUNTY REGISTRY OF DEEDS

DAMS FILE COLLECTION

BOOK D21

CITY OF WESTFIELD, MASSACHUSETTS

Donald E. Ashe, Register
Hampden County Registry of Deeds,
a Division of the Office of
William Francis Galvin, Secretary of the Commonwealth

TABLE OF CONTENTS ~ CITY OF WESTFIELD

Wilgus Dam

Arm Brook Flood Control Dam

Booth & Company Dam

Boy Scouts Dam

Chapin Pond Dam fka Cunningham Dam #3

Cook Dam

Crane & Company Dam

Curtis Lanes Dam

Florek Dam aka Florek Diary Farm Dam

Foster Machine Company Dam

Westfield Sportsmen's Club Dam fka Old Fuller Dam #2

Great River Dam aka Horton Dam

Horse Pond Dam

Horseshoe Pond Dam aka Horse Pond Dam
fka Cunningham Dam #4

Smith Dam

Powder Mill Brook Dam aka John C Buschmann's Sons Dam

Littleville Dam

Munn Brook Dam

TABLE OF CONTENTS ~ CITY OF WESTFIELD

Pallo Dam

Parker Dam

Perez Dam

Pieczarka Realty Company Dam

Powder Mill Brook Watershed

Saloomey Dam

Sandy Mill Brook Dam

Smit Dam

Springfield Boy Scouts Dam

Springfield Water Works Intake Dam

Stanley Park Dam aka Gillette Pond Dam fka Parker Dam

Stevens Paper Company Dams aka Crane's Mill Dams

Sunnyside Ranch Dam

Tekoa Dam

Turners Falls Power & Electric Dam fka Horton Dam

West Parish Filter Dam #1

West Parish Filter Dam #2

West Parish Filter Dam #3

TABLE OF CONTENTS ~ CITY OF WESTFIELD

Westfield Girl Scouts Dam

Westfield City Parks Dam fka Cunningham Dams

Westfield River Realty Trust Dam

Westfield River Watershed Association Inc.

YMCA Dam

Westfield City Water Dams

Wilgus Dam

1955 Westfield

Dam located on Ashley Brook. See also: County Roads Plan #13 (1947) "Log Dam - A H Wilgus on Ashley Brook - original and revised plans - (record book 26 page 69)".

City/Town	Westfield
Dam	Wilgus Dam
Name	Bannish, Anthony
Person	Wilgus, A H
Streets	Sunnyside Road
Streets	College Highway
Water	Ashley Brook

C-D

August 9, 1955

Hon. the Board of County Commissioners
Hampden County Court House
Elm Street
Springfield, Mass.

Gentlemen:

Yesterday, Monday August 8th, I received a call from Attorney Buschmann of Westfield, representing a Mr. Wilgus relative to a complaint by Mr. Wilgus that a person upstream of the pond and dam owned by Mr. Wilgus on Ashley Brook in Westfield, had excavated a hole and formed a pond in the brook, preventing the flow of brook water into the pond owned by Mr. Wilgus.

The pond owned by Mr. Wilgus is located on Ashley Brook at a point approximately 3500 feet northerly of the Southwick Town Line and westerly of College Highway, approximately 2000 feet. The pond owned by Mr. Wilgus is used for public swimming purposes.

An investigation in the field was conducted yesterday afternoon and it was found that at the head waters of Ashley Brook in the immediate vicinity of the Southwick Town Line an excavation of about 1000 yards volume had been dug in the swampy area in the vicinity of the Ashley Brook origin. This excavation is on the property of Anthony Bannish whose address is Sunnyside Road in Westfield.

The excavation has been done for the purpose of forming a source of water supply for irrigating the land and the crops on the Bannish property. The water is stored entirely within an excavation and at the time of inspection, the excavation was only approximately half full. Based on the size of the excavation, if filled to capacity, about 200,000 gallons of water would be stored. The drainage area contributory to the excavation is a small fraction of a square mile. Excess earth from the excavation has been piled in various locations around the perimeter of the excavation. In so doing, however, no damming of the brook is formed that could be considered more than two or three feet in height at the very most.

Thus, the water now in storage and that can be stored by Anthony Bannish does not constitute the storage of water behind a dam that would come under jurisdiction of your Board. I have outlined this condition to Attorney Buschmann verbally via telephone, and also explained to Mr. Wilgus the three requirements for drainage area, quantity of water stored, and height of dam that must be

COPY

involved in the case before your Board would have power to take action.

I have advised Attorney Buschmann that it will be necessary for Mr. Wilgus to take action against Mr. Anthony Bannish if he so desires, through some other means than through County jurisdiction over dams and water storage.

The above information is transmitted to you for your file purposes.

Respectfully submitted,

GHM*emm

George H. McDonnell
County Hydraulic Engineer

Oct. 1, 1958

Mr. A. H. Wilgus
25 Fowler Street
Westfield, Mass.

Dear Sir:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition, and safety of the dams of Hampden County, you are hereby advised that your dam in Westfield at the site of your swimming pond, damaged by the flood of August, 1955, has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "Conditions at this dam are the same as reported a year ago. The breach that was caused by the flood of August, 1955 to the left of the spillway still exists. Debris in this breach should be cleared so that a free waterway will exist to allow for the passage of storm flows. It is recommended that the owner be notified of this condition."

It is apparent that you probably do not intend to repair the breached dam in the near future. This is made evident by the fact that you now have a swimming pool independent of the main brook. However, the debris now existing in the breach of the old dam site should be removed during the coming winter. Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

HAMPDEN COUNTY COMMISSIONERS

____
Chairman

____

____

Arm Brook Flood Control Dam

1963 Westfield

Flood control dam built by Army Corp of Engineers - situated adjacent to the Mass Pike.

City/Town	Westfield
Dam	Arm Brook Flood Control Dam
Dam	U S Army Corp of Engineers
Name	U S A
Water	Arm Brook

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

March 12, 1963
CD Westfield
Re: Arm Brook Flood Control Dam
Westfield, Massachusetts

The Honorable
Board of County Commissioners
Hampden County Courthouse
37 Elm Street
Springfield, Massachusetts

Gentlemen:

On Friday, March 8, 1963, the undersigned inspected the partially completed above subject dam for the purpose of determining whether or not the structure is in satisfactory condition to safely pass anticipated flood flows of this coming spring. This flood control dam which is being built under contract with the U. S. Government, was started last year and with the coming of freezing weather, work was, of necessity, suspended. The grade of the embankment was not brought up to spillway elevation and consequently, it was necessary for the contractor to make a temporary spillway arrangement to pass the anticipated spring flood runoff. Prior to the shutdown of the job for the winter, the undersigned, together with representatives of the Federal Agency and the contractor, met pertaining to steps that should be taken to protect the partially completed dam. These steps included the preparation of the conduit intake shaft to function thru the lower opening and thru the top of the structure as built to date. Also, the embankment was to be built up on the upstream edge to provide additional head for operation of the conduit inlet. Thus, the maximum possible capacity of the conduit has been obtained based upon the height to which the embankment had been raised and then extended at the upstream edge at the time of the shutdown.

In addition to this capacity, which by computation exceeds the anticipated normal spring runoff by a reasonable degree of safety, a special flume was arranged at and across the top of the embankment to concentrate any overflow into a temporarily shaped and plastic sheet lined water course. This extra feature would only function if runoff this spring greatly exceeds the anticipated runoff or if the conduit or the inlet shaft becomes plugged with debris.

At the time of the inspection, it was noted that all precautions, as planned, had been taken and that the dam embankment as completed at the time of the shutdown is in readiness to meet the spring flood runoff based upon the general conference of early last winter.

The inspection on March 8th was made two days following the warm rain of Wednesday, March the 6th. It was noted that no water was impounded at that time behind the embankment and the conduit handled the runoff in a satisfactory manner.

Snow cover on the valley is not too deep but snow at present contains a relatively high concentration of water.

Should an extended heavy warm precipitation occur before this snow leaves the valley, the undersigned will advise the contractor to have personnel at the dam to take any precautions necessary to protect the structure from damage.

In summary, the Arm Brook dam embankment, as existing at the present time, is satisfactory to meet the anticipated spring flood runoff.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/kas

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Westfield
April 10, 1964

The Hon. the Board of County Commissioners
Hampden County Court House
Springfield, Massachusetts

Gentlemen:

On Tuesday, April 7, 1964, the undersigned together with local, County and Federal officials of the Conservation Service, examined the flood control dam on Arm Brook, situated adjacent to the Mass. Turnpike for the purpose of determining what maintenance work is needed on the structure following Winter weather and Spring runoff conditions.

An inspection of the dam was held late last year and at that time it was the understanding of the undersigned that the dam would be repaired in the Spring of this year, depending upon work that would become necessary as the result of frost action and surface runoff over the construction area. The dam embankment and construction area was seeded late in the year and it was recognized that grass growth would be quite sparse and would have little effect on controlling any erosion, particularly in areas of concentrated surface runoff.

At that conference I pointed out to all present that the undersigned would make no recommendation to your Board until in the Summer or Fall of 1964 since I wished to see the effect of weather on the dam embankment following the Spring of 1964 and to observe the grass growth in the Summer of 1964.

At our inspection conference on Tuesday, April 7, I was informed that the dam has been accepted from the Contractor apparently either at State or Federal level and that as a result of this acceptance the Contractor will not now be required to make repairs to the embankment and the general construction area.

The undersigned pointed out that whether or not the dam is accepted at State and Federal level, I cannot make a recommendation of acceptance to your Board until such time as I am satisfied that the various erosion gulleys are repaired, a good growth of grass and turf has been promoted and a complete inspection has been made of the entire construction, including the conduit and the outlet works.

It is my understanding that the local and County representatives of the Soils Conservation Service will attempt to work out a program wherein sufficient funds can be added to the maintenance budget for this year to pay for the necessary repairs. The amount of repair work to be done is not great but in my opinion will exceed a thousand dollars.

Downstream of the dam where the embankment joins the natural valley wall, fairly deep gulleys have been formed and on various areas of the dam many small gulleys have been washed by surface runoff. All of these need treatment, filling and regrading.

Gulleys have been formed in the emergency spillway but they are not of a serious nature. However, if they are not repaired this year they will become worse and worse and eventually require expensive maintenance work. None of the gulleying that now exists endangers the dam.

In order that the structure can withstand surface runoff, a good growth of turf is needed over the entire area. Grass has started to grow but is sparse in many areas and I doubt if the thin areas will fill in satisfactorily to promote a thick turf unless there is additional seeding and fertilizing done.

The emergency spillway should be covered with a very thick growth of turf. However, at the present time the grass growth in the spillway is poor.

The undersigned will continue to observe the dam from time to time during 1964 and has made a tentative appointment with a representative of the Soils Conservation Service to be present when a thorough inspection of the dam will be made during this Summer. At that time a communication should then be sent to the City of Westfield, as well as to the County office of the Soils Conservation Service pointing out any deficiencies found and the fact that the dam must be in excellent condition in all respects before acceptance can be made by your Board.

Respectfully submitted

George H. McDonnell
County Hydraulic Engineer

GHM/cmb

Booth & Company Dam

1926 Westfield

Located on Pond Brook.

City/Town	Westfield
Dam	Booth & Company Dam
Name	Booth & Company Inc
Name	Booth & Company Ltd
Name	Cunningham, William
Water	Pond Brook

Page 73 of report.

William Cunningham,
Booth & Company Ltd.,
57 Beacon St.,
New York City, N.Y.

you are notified that your upper dam, located on Pond Brook so called in the City of Westfield, etc.

"The dam, which appears as if it is an abandoned structure, requires some repairs in the way of levelling up the top of the embankment to its original height etc., but it is recommended especially that the overflow channel be cleaned and all the debris therein removed, also the growth of brush at and around its entrance cut down and the narrow approach to the entrance widened and deepened."

Now, therefore, etc.

February 17, 1926

William Cunningham,
Booth & Company, Ltd.,
57 Beacon St.,
New York City, N.Y.

Dear Sir:

In accordance with the provisions of Section 45 of Chapter 253 of the General Laws as amended by Chapter 334 of the Acts of 1923 and as further amended by Chapter 178 of the Acts of 1924 relative to the inspection, condition and safety of the dame of Hampden County, you are notified that your upper dam, located on Pond Brook, so-called, in the City of Westfield, has been inspected by our engineer and your attention is called to the following recommendations made by him;

> "The dam, which appears as if it is an abandoned structure, requires some repairs in the way of levelling up the top of the embankment to its original height etc., but it is recommended especially that the overflow channel be cleaned and all the debris therein removed; also the growth of brush at and around its entrance cut down and the narrow approach to the entrance widened and deepened."

Now, therefore, in accordance with Section 46 of said Chapter 253, it is ordered that the above recommendations be complied with in a reasonable time.

Yours very truly,

COUNTY COMMISSIONERS

By__________________
Chairman.

____

____

Page 72 of report.

William Cunningham,
Booth & Company Ltd.,
57 Beacon St.,
New York City, N.Y.

You are notified that your lower dam, located on Pond Brook so called in the City of Westfield, etc.

"The east abutment is in poor condition as the masonry therein has settled and is cracked.

It is recommended that this abutment be repaired and that the apron be replanked where needed."

Now, therefore, etc.

February 17, 1926

William Cunningham,
Booth & Company Ltd.,
57 Beacon St.,
New York City, N.Y.

Dear Sir:

In accordance with the provisions of Section 45 of Chapter 253 of the General Laws as amended by Chapter 334 of the Acts of 1923 and as further amended by Chapter 178 of the Acts of 1924 relative to the inspection, condition and safety of the dams of Hampden County, you are notified that your lower dam, located on Pond Brook, so-called, in the City of Westfield, has been inspected by our engineer and your attention is called to the following recommendations made by him;

> "The east abutment is in poor condition as the masonry therein has settled and is cracked.
>
> It is recommended that this abutment be repaired and that the apron be replanked where needed."

Now, therefore, in accordance with Section 46 of said Chapter 253, it is ordered that the above recommendations be complied with in a reasonable time.

Yours very truly,

COUNTY COMMISSIONERS

By____________________
Chairman.

____

____

BOOTH & CO., INC.

NEW YORK, 57 BEEKMAN STREET
BOSTON, 142 PEARL STREET
LONDON, 15-16 RAILWAY APPROACH
LONDON BRIDGE, S. E.
NEW YORK TELEPHONE, WHITEHALL 1680

ALFRED BOOTH & CO., LTD.
CUNARD BUILDING
LIVERPOOL

SYDNEY: N. S. W. AUSTRALIA
CHRISTCHURCH, NEW ZEALAND
CABLES, ALBO, NEW YORK
CODES
A1, A.B.C. 4TH & 5TH EDITIONS, TYBO, LIEBERS

57 BEEKMAN STREET
NEW YORK

CLM:LS

February 20, 1926

County Commissioners,
County of Hampden,
Springfield, Mass.

Dear Sirs:-

We have to acknowledge your two favors of the 17th instant, in reference to property at Westfield, Mass. in the name of William Cunningham.

Mr. Cunningham at the present time is in New Zealand but we will put your letters before him on his return.

Yours truly,

BOOTH & CO., Inc.

By C. L. Muller

Dam

BOOTH & CO., INC.

NEW YORK, 57 BEEKMAN STREET
BOSTON, 142 PEARL STREET
LONDON, 15-16 RAILWAY APPROACH LONDON BRIDGE, S. E.
NEW YORK TELEPHONE, WHITEHALL 1680

ALFRED BOOTH & CO., LTD.
CUNARD BUILDING
LIVERPOOL

SYDNEY, N. S. W., AUSTRALIA
CHRISTCHURCH, NEW ZEELAND
CABLES, ALBO, NEW YORK
CODES
A1, A.B.C. 4TH & 5TH EDITIONS, TYBO, LIEBERS

57 BEEKMAN STREET
NEW YORK

WC:LS

November 26, 1926

County of Hampden,
Springfield, Mass.

Dear Sirs:-

I am in receipt of yours dated November 24th, enclosing copies of letters sent to me on February 17th, 1926, regarding the condition of the dams of Hampden County.

I was abroad at the time the earlier communications were received, and the matter was referred to Mr. Russ, who formerly occupied the premises.

I am asking Mr. Russ to investigate and I shall go into the matter with him in due course.

Yours truly,

Wm Cunningham

BOOTH & CO., INC.

NEW YORK, 57 BEEKMAN STREET
BOSTON, 142 PEARL STREET
LONDON, 15-16 RAILWAY APPROACH
LONDON BRIDGE, S. E.
NEW YORK TELEPHONE, WHITEHALL 1680

ALFRED BOOTH & CO., LTD.
CUNARD BUILDING
LIVERPOOL

SYDNEY, N. S. W., AUSTRALIA
CHRISTCHURCH, NEW ZEELAND
CABLES, ALBO, NEW YORK
CODES
A1, A.B.C. 4TH & 5TH EDITIONS, TYBO, LIEBERS

57 BEEKMAN STREET
NEW YORK

WC:LS

December 6, 1926

Commissioners,
County of Hampden,
Springfield, Mass.

Sirs:-

Westfield, Mass. Factory Property

I have gone into the question of the repairs necessary to the dam controlling the water-flow into the Westfield factory.

I understand that it will be quite satisfactory to have this work done in the Spring time.

Mr. Russ, the former occupant of the premises, will attend to the matter.

Yours truly,

W^m Cunningham

Boy Scouts Dam

1948 Westfield

Dam of a small pond at Camp Robinson on Pontoosic Road.

Abutters	Camp Robinson
City/Town	Westfield
Dam	Boy Scouts Dam
Name	Boy Scouts of America
Streets	North Lonyard Road
Streets	Pontoosic Road
Water	Great Pond
Water	Little River Road
Water	North Brook

COPY

November 10, 1948

The Hampden Council of the Boy Scouts of America
145 State Street
Springfield, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your swimming pool dam located on a tributary of Great Brook in the City of Westfield has been inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him:

> "In a recent inspection made of the Springfield Boy Scouts Swimming Pool Dam located on a tributary of Great Brook in the City of Westfield, it was found that the flashboards in the spillway are carried to within a few inches of the level of the top of the earth embankment leaving little or no freeboard to care for high stream flow. The flashboards should be removed during the winter and spring freshet period."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By William Dwight
Chairman

Thomas F. Sullivan

November 22, 1950

Boy Scouts of America
145 State Street
Springfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam located off North Longyard Road in the southeasterly corner of Westfield and on a tributary of Great Brook has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him:

> "Flashboards are still in place on the spillway and should be removed until after the spring runoff."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

COUNTY COMMISSIONERS

By Thomas F. Sullivan
Chairman

William F. Stapleton

Francis M. O'Keefe
Acting County Commissioner

Westfield

HAMPDEN COUNCIL
BOY SCOUTS OF AMERICA, Inc.
145 State Street
SPRINGFIELD 3, MASSACHUSETTS

November 28, 1950.

County Commissioners
Court House
Springfield, Massachusetts

Gentlemen:

In compliance with your notification of November 22, 1950, this is to report that the flashboards in the dam located on our property off North Longyard Road, on a tributary of North Brook, have been removed.

Very truly yours,

John C. Norsk

John C. Norsk,
Scout Executive

JCN/w

Copy of this mailed to George H. McDonnell, County Hydraulic Engineer, on November 30, 1950.

June 27, 1951

Boy Scouts of America
145 State Street
Springfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam located off North Longyard Road in the southeasterly corner of Westfield and on a tributary of Great Brook has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him:

> "Brush and scrub growth should be cleaned from the dam and the top of the dam filled, where necessary, with earth and gravel to eliminate all holes and worn places."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

COUNTY COMMISSIONERS

By ______________________
Chairman

____

____

Westfield

Feb. 6, 1957

Boy Scouts of America,
134 Chestnut Street
Springfield, Mass.

Gentlemen:

In accordance with Chapter 253 of the General Laws of the Commonwealth of Massachusetts, an inspection has been made of the various dams in the City of Westfield, among which is a dam apparently owned by your organization and situated on a tributary to Great Brook, at a point westerly of Little River Road just northerly of the Southwick town line. This dam is an earth and masonry structure with a spillway overflow near the left side of the dam. When last inspected, the County Hydraulic Engineer reported that a washout on the downstream side of the dam, adjacent to the right side of the spillway has not been repaired and that water was being impounded behind the dam. The report of the County Hydraulic Engineer to this Board is summed up in the final sentence as follows: "It is recommended that the owner of the structure be advised of this condition in writing and that no water be ponded at the dam until it has been repaired and the repairs inspected and approved."

Will you kindly have the necessary repairs made as soon as possible, and when they have been completed the County Hydraulic Engineer will inspect the dam again. No water should be stored behind the dam until the repairs have been approved. If you have any questions regarding the method of making the repairs, the County Hydraulic Engineer will be pleased to assist you in this matter.

Very truly yours

BOARD OF COUNTY COMMISSIONERS

____

____

____

Nov. 27, 1957

Boy Scouts of America
134 Chestnut Street
Springfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq of the General Laws, Tercentenary Edition, relative to the inspection, condition, and safety of the dams of Hampden County, you are hereby advised that your dam situated on a tributary to Great Brook at a point westerly of Little River Road just northerly of the Southwick Town line has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "This structure is an earth and masonry dam that is relatively high but impounds a small volume of water on a tributary to Great Brook in the southeasterly portion of Westfield. In the flood of August, 1955, a portion of the earth embankment was washed out. A part of the spillway foundation was also washed out. When last inspected, it was noted that the dam had not been repaired. This dam should be either repaired or properly breached and abandoned. At the present time, the drainpipe is open and no pond is formed. However, the drain is not sufficiently large to pass storm flows and it is possible that the pond could become filled at time of heavy runoff. It is recommended that the owner of this dam be advised to either repair the dam or to breach the structure so that no water can be ponded in time of high runoff."

If it is not expected that this dam will be repaired, the structure should have a sizable breach formed to allow for the free passage of storm flows. Any further information you may desire will be furnished by this office upon request.

Very truly yours,
HAMPDEN COUNTY COMMISSIONERS

____
Chairman

____

____

Hampden Council
NO. 234
BOY SCOUTS OF AMERICA, Inc.
134 CHESTNUT STREET - SPRINGFIELD 3, MASSACHUSETTS

Mail To Mr. Geo. McDonnell
Holyoke

April 18, 1958

William F. Stapleton, Chairman
County Commissioners
Hampden County
Springfield, Massachusetts

Dear Mr. Stapleton:

Following the recommendation of your Commission, we have inspected our dam at a point westerly of Little River Road, just northerly of the Southwick town line. This was done during the last heavy run-off at which time it was found that the amount of water stored was almost negligible with a full and fast flow through the drain pipe. It is not our intention to repair the dam. In your opinion is it necessary to breach the dam as long as water was not stored during one of our heaviest run-offs? If so, please send us your recommendations on the procedure to follow.

Most sincerely

Russell G. Exley
Russell G. Exley
Scout Executive

Copy of this letter sent to
Mr. McDonnell on April 28, 1958.

Agawam
Blandford
Brimfield
Chester
Chicopee
East Longmeadow
Granville
Hampden
Holland
Huntington
Longmeadow
Ludlow
Monson
Palmer
Russell
Southwick
Springfield
Wales
Westfield
West Springfield
Wilbraham

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
STRUCTURAL ENGINEERING
ELECTRICAL ENGINEERING

TIGHE & BOND, INC.
CONSULTING ENGINEERS
BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991
GEORGE H. McDONNELL
PHILIP W. SHERIDAN

DAMS & POWER INSTALLATIONS
HIGHWAYS & BRIDGES
HOUSING DEVELOPMENT
WASTE DISPOSAL

CD Westfield

August 13, 1958

The Hon. the Board of County Commissioners
Hampden County Court House
Springfield, Mass.

Gentlemen:

Reference is made to the letter dated April 18, 1958, received from Russell G. Exley, Scout Executive, Hampden Council #234, Boy Scouts of America, Inc., at 134 Chestnut St., Springfield, Mass. This letter had to do with the dam owned by the Boy Scouts and located westerly of Little River Road in Westfield, just northerly of the Southwick Town line. Previously, the Boy Scouts had been informed by your Board of the advisability of either repairing their dam, damaged during the flood of August, 1955, or breaching the structure so that no water would be stored behind the dam.

Scout Executive Exley pointed out in his letter that during a heavy runoff, following a rain storm, it was found that the amount of water stored in the pond was almost negligible and a full and fast flow of water occurred from the drain pipe thru the dam.

Scout Executive Exley stated in his letter that it was not the intention of the Boy Scouts to repair the dam and requested your opinion regarding the necessity to breach the dam, as long as water was not stored during a heavy runoff period.

I have examined this dam recently, and from time to time during the summer, to note conditions that exist under varying rates of runoff. It does appear that even under heavy runoff conditions water is not stored to any great height behind the partly destroyed dam. In all probability, the dam, though damaged somewhat, will not fail from water stored for short periods of time behind the dam during extreme runoff conditions. As long as the drainpipe functions, little water will be stored. However, there is always the danger that at some time or another, children playing in the area or even grownups passing thru the area may plug the drainpipe on the end toward the pond. This could be done as an act of mischief or it would be done innocently by persons wishing to create a small pond. If the outlet pipe is plugged in that manner, then the pond would fill to the level of the spillway and it would be difficult to unplug the drain pipe. Also, full head could then be placed against the dam and against the concrete core wall that has been exposed by the flood waters of 1955. Approximately 30 to 35 lineal ft. of the core wall is exposed. At places, the unsupported height of the wall is in the neighborhood of 6 ft.

Full hydrostatic head placed against this wall for a period of time, might cause failure of the wall and any persons immediately downstream from the dam at the time the wall failed might be injured either by the wall itself or by the rush of released water. Such an injury could result in a serious claim against the Boy Scout Organization. The dam is known to have been damaged and conditions could occur as outlined hereinabove wherein the wall could fail. These facts having been brought to the attention of the Owners could probably be evidence to indicate negligence on their part.

Since there is a possibility that the drain pipe can be plugged and that the plugging of the drain pipe might go unnoticed for some time, and since the Boy Scouts of America, Inc. apparently have no intention of repairing the dam, I still feel that it would be advisable to breach the structure.

Breaching of the structure could take place by causing the failure of the concrete wall and thus opening a hole thru the dam where the water of the brook could pass, should the pipe be plugged. The breach thru the dam should be wide enough so that persons cannot easily plug it.

The concrete wall could probably be breached thru the use of sledge hammers, dynamite or pneumatic tools. The earth embankment upstream of the concrete wall should be excavated wide enough and deep enough to prevent ponding of water.

I am enclosing extra copies of this letter in case you wish to forward a copy directly to Mr. Exley of the Boy Scouts of America. I will be pleased to meet with Mr. Exley at some future date, if he so desires, to go over the problem in the field regarding the breaching of the dam.

Respectfully submitted,

G H McDonnell
George H. McDonnell
County Hydraulic Engineer

GHM/mb

/enc.

August 20, 1958

Russell G. Exley, Scout Executive,
Hampden Council #234, Boy Scouts of
America, Inc.,
134 Chestnut Street,
Springfield, Mass.

Dear Mr. Exley:

Enclosed herewith for your information is copy of letter dated August 13, 1958 received by the Hampden County Commissioners from George H. McDonnell, County Hydraulic Engineer.

Very truly yours,

HAMPDEN COUNTY COMMISSIONERS

By Ralph P. Walsh
n.

RPW/N
encl.

December 2, 1959

Boy Scouts of America, Inc.
Hampden Council 234
134 Chestnut Street
Springfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition, and safety of the dams of Hampden County, you are hereby advised that your dam in Westfield situated westerly of North Longyard Road and north of the Southwick Town line, has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "When last inspected on November 16, 1959, it was noted that this structure was still in the same condition that has existed since the flood of August, 1955. Earth fill has been washed from the embankment exposing a concrete core wall and removing earth support from the downstream face. The spillway chute has been undermined and is in part suspended in air instead of resting on a suitable foundation as needed. The pond was full to the spillway level on the date of this last inspection and water was overflowing thru the undermined spillway. In the past, a communication from the Boy Scout Headquarters indicated that an inspection made after a storm causing heavy runoff showed a negligible quantity of water in the pond. Apparently the drainpipe is now plugged for the flow of the brook has filled the pond.
>
> Failure of the dam will not release a great quantity of water since the pond area is small and thus, danger to persons and property downstream is negligible. However, any children in the immediate area of the structure might be seriously injured should the spillway fail or the core wall collapse as the result of the dam impounding water to spillway level. Since this dam is over 10 ft. in height above the bed of the brook at the spillway

> and thus comes under Chapter 253 of the General Laws of the Commonwealth, the owner should either properly repair the dam or breach the structure in such a way that it will eliminate any danger of accidents to persons that might occur should the spillway collapse or the core wall fail."

As pointed out by the Engineer in his report, there is little danger of the sudden release of stored water doing damage to persons and property downstream of your dam. The brook on which the dam is located discharges into Great Brook a short distance to the west. Great Brook could absorb the quantity of water that would be released by failure of your dam since the brook is fairly large. There is, however, the danger that the undermined spillway itself or the unsupported concrete wall might collapse and should any children be in the area of the dam when a failure took place, they might be seriously injured. The structure as it now exists was not designed to be undermined and unsupported.

It is recommended that you take the necessary action to either repair the structure so that it will be safe or demolish the dam to eliminate the danger as outlined herein.

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

HAMPDEN COUNTY COMMISSIONERS

____

____

____

Nov. 30, 1960

Boy Scouts of America, Inc.
Hampden Council 234
134 Chestnut Street
Springfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition, and safety of the dams of Hampden County, you are hereby advised that your dam in Westfield situated westerly of North Longyard Road and north of the Southwick Town line, has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "This dam is still in the same condition as previously reported despite the fact the structure was to have been breached to prevent the ponding of water. At the time of the last inspection on November 2, 1960, the drain was partly plugged and water level in the pond back of the dam was at spillway grade. Water was flowing thru the spillway and debris partly blocked the spillway opening.
>
> Earth fill has been washed from the embankment in the flood of August, 1955 exposing a concrete core wall and removing earth support from the downstream face. The spillway chute has been undermined and is in part, suspended in air instead of resting on a suitable foundation as needed.
>
> Failure of this dam will not release a great quantity of water since the pond area is small and thus, danger to persons and property downstream is negligible. However, any children in the immediate area of the structure could be seriously injured should the spillway fail or the core wall collapse as the result of the dam impounding water to spillway level. Since the height of the dam is well over 10 ft. above the bed of the brook, the structure does

> come under Chapter 253 of the General Laws of the Commonwealth. The Owner should either properly repair the dam or the structure should be breached and done away with to eliminate any danger of accidents to persons that could occur should the spillway structure collapse or the core wall fail.
>
> It is recommended that your Board again call to the attention of the Officials of the Boy Scouts that the dam, as existing, is a liability and could be the cause of injury or even loss of life of an individual."

Since the dam as now existing does come under Chapter 253 of the General Laws, because of its height above the bed of the stream and since there is a definite possibility, as pointed out by the County Hydraulic Engineer, that some individual may be injured or even killed because of failure of the dam, it seems unwise to allow the structure to continue in its existing condition. The dam should either be properly repaired and made acceptable from a safety viewpoint, or it should be properly abandoned and breached so that it will not be a liability to the Boy Scouts of America.

Our Board would be pleased to have the County Hydraulic Engineer meet with a representative of the Boy Scouts, if such a meeting would be beneficial and aid you in arriving at a decision as to either maintaining the dam in a proper condition or abandoning and breaching the structure.

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

____

____

____

Boy Scouts Westfield

Sept. 20, 1961

Boy Scouts of America, Inc.,
Hampden Council 234
134 Chestnut Street
Springfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam in Westfield, situated westerly of North Longyard Road and north of the Southwick Town line, has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "This dam is still in the same general condition as previously reported in annual reports and special letter reports. At the time of the last inspection on July 27, 1961, it was noted that the pond was at a low level but the drain apparently was partly plugged.
>
> Earth fill was washed from the embankment during the flood of Aug. 1955 exposing the concrete core wall and removing earth support from the downstream face. The spillway chute was undermined at the same time and a portion is now suspended in air instead of being supported on a suitable foundation. This condition has existed year after year. At times in the past, the undersigned has reported water in storage to the spillway level. As pointed out previously, failure of this dam will not release a great quantity of water since the pond area is small and thus, danger to persons and property downstream is not great. However, should a child be playing in the immediate area of this structure when a collapse occurs, that child could be seriously injured or even killed. Because of the possibility of serious liability, should such an accident occur, the Owner of the dam should either properly repair the structure or should breach it and do away with it.
>
> It is recommended that your Board again call to the attention of the

> officials of the Boy Scouts that the dam, as existing, is not safe, that they have been notified of the condition many times and that these notices are a matter of official record. Injury to any person as the result of the condition at the dam might result in serious consequences depending upon what action would be taken by the injured or their family."

Since the dam is not in a safe condition as the result of the flood water of six years ago and since there is a possibility, however remote, that someone could be injured by a failure of the structure, it would seem advisable for the officials of the Boy Scouts of America to take some definite action to prevent the occurrence of an accident and thus the possibility of serious injury or death to an individual. The dam should either be properly repaired and made acceptable from a safety viewpoint, or it should be breached and destroyed in such a manner that it will not be a liability to your organization.

The Board will be pleased to cooperate with the officials of your organization in any way possible and we offer the services of the County Hydraulic Engineer to advise you in reaching a decision as to whether to maintain the dam by restoring it thru proper repairs or abandoning it by breaching.

Will you please consider this matter at your next business meeting wherein such matters would normally be on the official agenda and then notify our Board of what action you plan to take.

Very truly yours

BOARD OF COUNTY COMMISSIONERS

____

____

____

Oct. 10, 1962

Pioneer Valley Council, Inc., No. 234
Boy Scouts of America
1639 Riverdale St.
West Springfield, Mass.

Gentlemen:

In reference to your communication of Sept. 13, 1962, the County Hydraulic Engineer has examined the dam at the small pond at Camp Robinson on Pontoosic Road in Westfield and reports to our Board that a breach has been made in the upper masonry wall and thru the earth embankment section. As a result of the breach, water is no longer ponded and flood flows will pass thru the dam without causing any storage.

As existing, the dam is now satisfactory and you have complied with the request of this Board.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

____

____

____

Pioneer Valley Council, Inc. BOY SCOUTS OF AMERICA
No. 234
SIXTEEN THIRTY-NINE RIVERDALE STREET Telephone REpublic 7-0204 WEST SPRINGFIELD, MASSACHUSETTS

September 13, 1962

Westfield

County Commissioners of Hampden County
37 Elm Street
Springfield, Massachusetts

Gentlemen:

This council has finally succeeded in razing the dam of a small pond at Camp Robinson on Pontoosic Road in Westfield. We consulted with the hydraulic engineer before doing the job and believe it to be to his satisfaction. In any event, we would appreciate a letter from the commissioners after he has made an inspection, informing us that we have complied with the original request.

Sincerely,

Russell G. Exley
Russell G. Exley
Scout Executive

RGE/sm

Copy of this letter send to George H. McDonnell,
Cty Hydraulic Engineer, on Sept. 17,1962.

A MEMBER AGENCY OF:
THE UNITED FUND OF GREATER SPRINGFIELD, INC., HOLYOKE COMMUNITY CHEST, CHICOPEE COMMUNITY CHEST, PALMER COMMUNITY CHEST
SERVING THE TOWNS OF:
AGAWAM
BLANDFORD
BRIMFIELD
CHESTER
CHICOPEE
EAST LONGMEADOW
GRANVILLE
HAMPDEN
HOLLAND
HOLYOKE
HUNTINGTON
LONGMEADOW
LUDLOW
MONSON
PALMER
RUSSELL
SOUTHWICK
SPRINGFIELD
WALES
WESTFIELD
WEST SPRINGFIELD
WILBRAHAM

Chapin Pond Dam fka Cunningham Dam No 3

1950 Westfield

Located on Chapin Pond.

City/Town	Westfield
Dam	Cunningham Dam No 3
Dam	Chapin Pond Dam
Name	Westfield City Water Commissioners
Name	Cunningham
Water	Chapin Pond

November 22, 1950

Board of Public Works
City of Westfield
City Hall
Westfield, Mass.

Attention: Francis Martin, Superintendent

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam located on Chapin Pond, just south of Hampton Ponds has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him:

> "A large log has become lodged in the spillway approach channel and should be removed. The drawoff pipe has a wooden plug driven in the discharge end and the pipe is now under full hydrostatic head. Leakage from the drawoff pipe could cause the loss of the dam. The gate on the upstream end of the drawoff pipe should be replaced or repaired so that it will close properly, and the plug should be removed from the discharge end of the drawoff pipe."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

COUNTY COMMISSIONERS

By Thomas F. Sullivan
Chairman

William F. Stapleton

Francis M. O'Keefe Acting County Commissioner

~~Hampton Ponds Dam~~

Chapin Pond Dam
Westfield

June 27, 1951

Board of Public Works
City of Westfield
City Hall
Westfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your Water Department dams in the Town of Granville and your dam located on Chapin Pond just south of Hampden Ponds, have been recently inspected by our Engineer, and your attention is called to the following conditions noted and recommendations made by him:

a. Wells Mills Dam on Hollister Brook in Granville: "Trees and brush growing on the dam should be removed, sunken spots on top of dam filled, and leaks investigated and stopped."

b. Strong Dam (lower dam) on Hollister Brook in Granville: "Trees should be removed from the dam and all brush and scrub growth cleaned off of the structure."

c. Granville Reservoir Dam: "Concrete in the spillway channel has disintegrated in many places and consideration should be given to repairing the channel in the near future."

d. Chapin Pond Dam in Westfield: "A large log has become lodged in the spillway approach channel and should be removed. The drawoff pipe has a wooden plug driven in the discharge end and the pipe is now under full hydrostatic head. Leakage from the drawoff pipe could cause the loss of the dam. The gate on the upstream end of the drawoff pipe should be replaced or repaired so that it will close properly, and the plug should be removed from the discharge end of the drawoff pipe. This work should be done immediately and the pond drawn down and kept down until the drawoff gate is placed in proper working order and the plug removed from the discharge end of the drawoff pipe."

Board of Public Works
Westfield, Mass.

6/27/51

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

COUNTY COMMISSIONERS

By ______________________________
Chairman

____

____

September 2, 1953

Superintendent Water Department
23 Sackett Street
Westfield, Massachusetts

Dear Sir:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam located below Hampton Ponds at Chapin Pond in Westfield, has been recently inspected by our Engineer, and your attention is called to the following conditions noted and recommendations made by him:

> "There is a plug which has been placed in the downstream end of the draw-off pipe which is located at the base and through the dam. Since the gate at the head of this pipe and located in the pond is apparently open or leaking, a head of pressure is created within the draw-off pipe. This pipe should not operate in this manner and if it is desirable to prevent leakage of pond water through this pipe the gate on the upstream end should be sealed rather than plug the downstream end of the pipe."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

COUNTY COMMISSIONERS

By____________________________
Chairman

____

____

November 16, 1966

Board of Water Commissioners
Water Department
Municipal Building
Westfield, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam at Chapin Pond and your dam at Tekoa Reservoir have been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

"Chapin Pond Dam

Brush growth on the downstream face of the embankment is quite thick and should be cut down. All debris in the spillway channel should be removed. The abutments supporting the bridge over the spillway channel are in poor condition and should be improved or replaced with good concrete abutments.

Settlement was noted on the top of the dam embankment at the roadway surface adjacent to the manhole at about the center section of the dam. This settlement should be investigated and any defect found should be corrected.

Tekoa Dam

Some of the stone masonry joints on the downstream face of the dam underneath the spillway notch need pointing. Vegetation growing from the stone masonry joints should be killed before the root structure damages these joints.

Settlement was noted along the outside face of the small wall paralleling the dam and forming a portion of the chute downstream

> of the dam and on the left bank of the stream valley. This undermining or settlement, so-called, should be repaired.
>
> The concrete masonry was okay. The spillway notch was satisfactory and free of debris. Water level in storage was down about one foot from the crest of the spillway notch on the day of inspection. Abutment areas and the small earth embankment to the right of the spillway were satisfactory. In the opinion of the undersigned, the dam was safe when inspected but maintenance work recommended hereinbefore should be done by the owner to prevent the need for expensive maintenance at a later date."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

____

____

____

Commonwealth of Massachusetts

County of Hampden

Springfield, Mass.

Office of the
County Commissioners
32 State Street

William F. Stapleton
Chairman
~~Ralph P. Walsh~~
Lloyd W. Fradet
Stephen A. Moynahan

December 10, 1969

Board of Water Commissioners
Westfield Water Department
Municipal Building
Westfield, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam at Chapin Pond has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "This dam is in the best condition noted in recent years. The embankment is fair to good. Brush has been cut from the surfaces of the embankment.
>
> A turf cover should be developed on the sloping surface of the downstream side. The riprap on the slope toward the pond is rough but okay.
>
> A large oak tree growing from the top of the dam embankment near the downstream edge should be cut down and the root growth killed.
>
> The spillway channel was observed to be free of debris. Better bridge abutments are desirable and should be constructed in the near future.
>
> The toe area of the embankment was wet but the condition was observed to be satisfactory.

> The irrigation pipe through the dam embankment at the right end has been capped, as recommended.
>
> On the day of inspection water level in storage was at the elevation of the spillway channel and was overflowing through the spillway at a fairly high rate.
>
> The dam is safe but the large oak tree should be removed and the owner should begin to develop a turf cover on the downstream slope as recommended."

The large tree growing from the top of the embankment at the downstream edge could, if blown down in a high wind storm, cause a major void across the top of the embankment which might result in the loss of the dam. It is recommended that the tree be cut down early in 1970.

In the budget for Water Department maintenance, funds should be included, in the near future, to provide better abutments for the bridge crossing the spillway at the dam.

Any further information concerning this dam which you may desire will be furnished by our office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

____

____

____

Cook Dam

- Westfield

Also see: Dam Report Section - Westfield.

City/Town	Westfield
Dam	Cook Dam

WESTFIELD
D21006

COOK DAM

D21006

NO IMAGE ON FILE FOR THIS RECORD

(INFORMATION EXISTS ONLY ON A FILE CARD FROM THE OFFICE OF THE FORMER HAMPDEN COUNTY ENGINEER.)

Crane & Company Dam

1926 Westfield

Dam located on Little River. ***See also:*** **"Stevens Paper Company Dams aka Crane's Mill Dams" - D21030.** ***See also:*** **County Highways (Westfield) - "Little River Dam - Crane Brothers".**

City/Town	Westfield
Dam	Crane & Company Dam
Name	Crane & Company
Water	Little River

February 17, 1926

Crane & Company,
Westfield, Mass.

Gentlemen:

In accordance with the provisions of Section 46 of Chapter 253 of the General Laws as amended by Chapter 334 of the Acts of 1923 and as further amended by Chapter 178 of the Acts of 1924 relative to the inspection, condition and safety of the dams of Hampden County, you are notified that your dam, located on the Westfield Little River, so-called, in the City of Westfield, has been inspected by our engineer and your attention is called to the following recommendations made by him:

> "The structure is in good condition and water tight, except at one point about fifty feet from its north end where there is a small leak through the masonry about a foot above the ledge foundation, and at another point in the retaining wall downstream from the north end of the spillway.
>
> While these leaks are not serious at present, it will be better to have them repaired. Repairs also should be made on the stone work of the retaining wall and jamb of the north abutment by resetting some of the stones and pointing with cement mortar."

Now, therefore, in accordance with Section 46 of said Chapter 253, it is ordered that the above recommendations be complied with in a reasonable time.

Yours very truly,

COUNTY COMMISSIONERS

By____________________
Chairman

____

____

Page 70 of report.

Crane & Company,
Westfield, Mass.

you are notified that your dam, located on the Westfield Little River so called in the City of Westfield, etc.

"The structure is in good condition and water tight, except at one point about fifty feet from its north end where there is a small leak through the masonry about a foot above the ledge foundation, and at another point in the retaining wall downstream from the north end of the spillway.

While these leaks are not serious at present, it will be better to have them repaired. Repairs also should be made on the stone work of the retaining wall and face of the north abutment by resetting some of the stones and pointing with cement mortar."

Now, therefore, etc.

March 24, 1926

Mr. J. C. Taylor,
Crane & Company,
Westfield, Mass.

Dear Sir:

Your letter of March 10th received relative to your dam in Westfield, and the writer notes what you say in regard to having it repaired as soon as the water is low enough to be drawn down, so that our Engineer can advise your Company what he thinks is the proper procedure.

Kindly make the proper notation so that this matter will not be overlooked in the early summer. We will gladly have Mr. James L. Tighe, our Engineer, meet with your people relative to this matter at that time.

Yours very truly,
COUNTY COMMISSIONERS
By ____________________
Chairman.

GSC/N

CRANE & CO.
INCORPORATED
PAPER MAKERS
ESTABLISHED 1801
DALTON, MASS., U.S.A.
WESTFIELD OFFICE -- WESTFIELD, MASS.

March 10, 1926

County Commissioners,
County of Hampden,
Springfield, Mass.

Gentlemen: Attention of Mr. George S. Cook, Chairman

Reply to your letter of February 17th has been delayed on account of our proper authority being out of the city. Our dam was built in 1902 under the supervision of Ellsworth & Kirkpatrick, Engineers, Holyoke, Mass. No expense was spared to have it first-class in all respects.

After the dam was completed, however, we found a couple of leaks such as you mention and a lot of work was carried on by digging out back of the dam to locate the trouble. In addition to this, large quantities of cement and stone were dumped on the inside of it in an effort to remedy the defect, but without satisfactory results.

In view of this could you send to our mill at some convenient time the engineer who made the recommendations as set forth in your letter? Probably he could make suggestions that would help us out of the difficulty as we want to meet the requirements as far as we possibly can. Of course the work could not be done at this time of the year on account of ice and high water, but it could be done during the summer season when the water in pond could be drawn off. We would keep this matter in mind, and advise you when to have your engineer come over. This letter is confirming our conversation by telephone this morning.

Yours very truly,

JCT/R

CRANE & CO. INC.

J.C. Taylor

CRANE & CO.
INCORPORATED
PAPER MAKERS
ESTABLISHED 1801
DALTON, MASS., U.S.A.
WESTFIELD OFFICE -- WESTFIELD, MASS.

July 16, 1926.

Geo. S. Cook, Chairman,
County Commissioners,
Springfield, Mass.

Dear Sir:

Referring to your letter of March 24th, we write to advise that the water is now quite low in our pond and it would probably be a good time for Mr. Tighe to come over and see the leaks in the dam.

If you will kindly notify us when he is coming, we will be on hand to go over the matter with him.

Yours very truly,
CRANE & CO. INC.
J. C. Taylor

JCT/P

Mr. Bond talked with Mr. Taylor & Mr. Taylor understands nothing will be done until Mr. Tighe returns the latter part of August

Tel. Mr. Bond on July 20 & he said he will call Mr. Taylor & make an appointment to see him in regard to this matter.

May 17, 1933

Crane & Company Inc.,
71 Mill Street,
Westfield, Mass.

Gentlemen:

In accordance with the provisions of Section 45 of Chapter 253 of the General Laws as amended by Chapter 334 of the Acts of 1923 and as further amended by Chapter 176 of the Acts of 1924 relative to the inspection, condition and safety of the dams of Hampden County, you are notified that your dam, located on the Westfield Little River in the City of Westfield, has been inspected by our engineer and your attention is called to the following condition noted and recommendation made by him;

> "At the angle in the dam toward its southerly end where the concrete portion connects with the stone masonry portion there is some disintegration in the downstream face, which should be repaired before it progresses any further."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By________________________
Chairman,

____

____

Curtis Lanes Dam

- **Westfield**

Also see: Dam Report Section - Westfield.

City/Town	Westfield
Dam	Curtis Lanes Dam

WESTFIELD
D21008

CURTIS LANES DAM

D21008

NO IMAGE ON FILE FOR THIS RECORD

(INFORMATION EXISTS ONLY ON A FILE CARD FROM THE OFFICE OF THE FORMER HAMPDEN COUNTY ENGINEER.)

Florek Dam aka Florek Dairy Farm Dam

1958 Westfield

Located on property of Florek Diary Farm.

Abutters	Florek Dairy Farm
City/Town	Westfield
Dam	Florek Dam
Dam	Florek Dairy Farm Dam
Name	Florek, Kazimierz
Streets	Granville Road

CD Westfield

August 13, 1958

Florek Dairy
960 Granville Road
Westfield, Mass.

Att: Mr. Florek

Gentlemen:

I have made a preliminary examination in the field and in the office of the site of your proposed dam and the plans of the structure as prepared by the U. S. Dept. of Agriculture. The site seems satisfactory and the dam, as planned, should be a safe structure and provide you with a good pond for your farming purposes.

I note in examining sheet #1 of the plans in the field, that the topography just upstream of the dam does not coincide with conditions as noted. Based upon the centerline of the dam, as pointed out to me when I was with you on Tuesday, August 12, 1958, there should be a valley shown on the contour plan extending in a general west and northwesterly direction. This is the valley that carries the water from the spring hole into the main brook. I have indicated upon the plan approximately where this valley is located and have crossed off a valley that is shown in a general northerly direction.

This is not an important matter since it does not affect the safety or construction of the dam. However, I thought you might like to call this to the attention of the Dept. of Agriculture personnel, in case they wished to adjust the contours to show the conditions that now exist in the field and will exist upon completion of the dam.

In reviewing these plans I do not note any detailed discussion of the treatment of the surface of the dam or the emergency spillway.

Final plans and specifications for the proposed construction should be prepared and two copies submitted by you to the Board of County Commissioners, Hampden County Court House, Springfield, Mass. These final plans should contain the recommended data and the additional data mentioned hereinabove.

In submitting the two complete sets of plans and specifications to the County Commissioners, submit a letter of request asking the Commissioners for permission to build the dam, as outlined in the specifications and as shown on the plans you file. In sending the plans and specifications you should submit a check made out to Hampden County in the amount of $5.00 to cover the filing fee. After the construction plans have been filed with the County, a complete review will then be made and a report submitted by the undersigned to the County Commissioners. You will then be notified of any changes needed and when you may begin construction of the project.

If you have any question on this matter, kindly call or write the undersigned.

The plans and specifications submitted to me are returned to you, enclosed in the attached package.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
STRUCTURAL ENGINEERING
ELECTRICAL ENGINEERING

TIGHE & BOND, INC.
CONSULTING ENGINEERS
BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991
GEORGE H. McDONNELL
PHILIP W. SHERIDAN

DAMS & POWER INSTALLATIONS
HIGHWAYS & BRIDGES
HOUSING DEVELOPMENT
WASTE DISPOSAL

CD Westfield

August 13, 1958

The Hon. the Board of County Commissioners
Hampden County Court House
Springfield, Mass.

Gentlemen:

Enclosed for your information and file purposes please find a copy of a communication sent to Florek Dairy of Granville Rd. in Westfield, Mass. pertaining to the request of Mr. Florek to construct a pond on his property to be used for irrigation purposes.

The drainage area involved is only a third of a square mile and the quantity of water to be normally stored in the pond is only slightly more than one-half million gallons. However, the height of the dam is 17 ft. and consequently, I have notified Mr. Florek that plans and specifications must be filed with your Board.

I have met with Mr. Florek here in my office regarding this matter and met with him in the field on the site of his property to review the proposed construction.

The enclosed copy of the letter to Mr. Florek is self-explanatory. No doubt he will be filing complete construction plans and specifications with your Board in the very near future.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

CD Westfield
Oct. 26, 1959

Mr. Kazimierz Florek
Granville Rd.
Westfield, Mass.

Dear Mr. Florek:

Reference is made to the proposed dam to be constructed on your property for the purpose of forming a pond to be used for irrigation and miscellaneous farming purposes. On Oct. 1, 1958, you requested approval of plans and specifications for the construction of the dam from the County Commissioners of Hampden County. This approval was granted in the form of an Interlocutory Decree dated Oct. 29, 1958.

On this date, Monday, Oct. 26, 1959, engineering representatives from th U. S. Conservation Dept. visited my office and discussed with me certain changes that you wish to make in connection with your proposed dam. It is my understanding that you have purchased some concrete sewer pipe from a contractor on a road or sewer project in Springfield and that you wish to use this concrete sewer pipe in connection with your overflow thru the dam and the vertical shaft to be built in relation thereto. The plans that are on file and which have been approved call for the standard corrugated iron type of construction. If you plan to use the concrete pipe described to me by the Conservation Service engineers doing your work, it will be necessary to change the design of the dam and to file with the County Commissioners revised plans showing the construction as you now are planning.

Concrete pipe will be acceptable thru the embankment of your dam provided that the pipe is laid at proper grade, is thoroughly and well cradled so that it cannot settle and provided that each joint of the pipe is made watertight. Watertight joints cannot be obtained thru the use of cement grout as a jointing material. A rubber or mechanical type joint should be provided to make the joint watertight. Also, proper cut-off walls or collars, so-called, must be included on the construction to prevent seepage from occurring along the outside surface of the concrete pipe. These cut-off walls will naturally encircle the concrete cradle that must be poured to support the pipe.

It is my understanding that the pipe you now have on hand has been obtained as surplus pipe from the construction job hereinbefore mentioned. Since this pipe will be used in the embankment of your dam, the pipe should be first quality pipe and you should obtain a statement from the inspecting engineer on the construction project that the pipe you purchased is not reject pipe but is surplus pipe of first quality. If the project from which you purchased the pipe is under the direction of the Dept. of Streets and Engineering in Springfield, you can probably obtain a certificate from that Department, indicating that the pipe you purchased was found to be satisfactory and was not ordered off of the job because of defects. The pipe to be used in the embankment of your dam is an important part of your entire construction program. Leakage either into or from the pipe could cause major difficulties in your earth embankment and might even result in the failure of your dam. Consequently, I am certain that you do not wish to install in your dam any material that might contribute to a serious maintenance problem.

Before proceeding with any actual construction, the revised plans showing the dam as it actually will be built should be filed with the County and approved. Also, before you actually start construction, kindly notify the undersigned well in advance of your construction schedule so that I may inspect the work as it proceeds.

Please do not hesitate to call upon the undersigned at any time for engineering assistance and advice in connection with your project.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/f

CD Westfield

October 26, 1959

The Hon. the Board of County Commissioners
Hampden County Court House - 37 Elm St.
Springfield, Massachusetts

Gentlemen:

Enclosed please find a copy of a communication sent to Mr. Florek of Westfield in connection with his proposed dam. Engineering representatives from the U.S. Soil Conservation Service have notified me that Mr. Florek plans to build his dam with materials other than those as specified and shown on plans approved by your Board. I have sent the enclosed communication to Mr. Florek to advise him that in changing materials, he changes the problems of construction and design. Consequently, revised plans should be filed with your Board, if Mr. Florek definitely goes ahead and plans his dam with the changed material. The contents of my letter to Mr. Florek are self-explanatory.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

Enc.

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND *CONSULTING ENGINEERS*

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

Rec'd Oct. 27/59

CD Westfield

October 26, 1959

The Hon. the Board of County Commissioners
Hampden County Court House - 37 Elm St.
Springfield, Massachusetts

Gentlemen:

Enclosed please find a copy of a communication sent to Mr. Florek of Westfield in connection with his proposed dam. Engineering representatives from the U.S. Soil Conservation Service have notified me that Mr. Florek plans to build his dam with materials other than those as specified and shown on plans approved by your Board. I have sent the enclosed communication to Mr. Florek to advise him that in changing materials, he changes the problems of construction and design. Consequently, revised plans should be filed with your Board, if Mr. Florek definitely goes ahead and plans his dam with the changed material. The contents of my letter to Mr. Florek are self-explanatory.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

Enc.

CD Westfield
May 4, 1961

Mr. Kazimierz Florek
960 Granville Road
Westfield, Massachusetts

Dear Mr. Florek:

The following is a summary of my meeting with you on Tuesday morning, May 2, 1961, together with Mr. French of the Soil Conservation Service.

You are planning to construct the dam as shown on the plans and as specified in the specifications filed with Hampden County. However, you anticipate changing the spillway by constructing the tube and the riser with concrete pipe, part of which you now have on hand. Since the plans now filed show construction with corrugated iron pipe and with a corrugated inlet shaft, the plans must be altered to show concrete pipe, if this material is to be installed in the dam.

By our count you have on hand approximately 42 ft. of 30" reinforced concrete pipe. This is made up of 11 lengths of usable pipe approximately 46" long in laying length.

In order to use this pipe it will be necessary to set it on a concrete cradle and to make up the joints with rubber gaskets. The concrete cradle should be at least 6" wider on each side of the pipe than the outside width of the pipe and the cradle should extend below the pipe by at least 8". Consequently, the volume of the cradle is estimated to be nearly 5 cu. ft. per running foot. Since this cradle must be formed properly and since reinforcing steel will be required, it can be expected that the concrete cradle in place, will cost you in the neighborhood of $7.00 a foot. The length of pipe to be cradled as shown on the plans is 62 ft. Thus, the total cost of the cradle will be $434.00, more or less. At the present time you are short about 30 ft. of concrete pipe. This will cost you at least $150 to buy the added pipe needed to have sufficient for constructing the conduit.

At the point where the 30" pipe will join with the vertical riser, it will be necessary for you to construct a junction box properly reinforced and properly bedded. This will require good and neat form work, reinforcing steel and careful workmanship. I feel certain that by the time this junction box structure is formed, poured and finished, you will have spent about $200 for labor and materials.

In order to use the 36" Lock Joint pipe as a vertical riser, it will be necessary for you to cut the pipe, since it is now too long or, lower the outlet pipe approximately 3 ft. In time and equipment costs, this will represent a charge of probably $80, more or less.

The concrete outlet pipe under the dam embankment will need cutoff walls to replace the corrugated iron collars shown on the plans. To excavate form and pour these collars in a proper manner will probably result in an expenditure of $60 or more. The concrete pipe will require gaskets, special handling and blocking procedure to hold the pipe in place while the concrete cradle is being poured under and around it. This cost for labor and materials will certainly be in the neighborhood of $1.00 a foot and thus result in an additional $70 charge.

At the present time you do not have on hand the pipe needed to extend from the base of the shaft to the bottom of the pond. This you would undoubtedly buy and would represent an expenditure of about $65.

The total cost, as outlined hereinabove, is $1,059. If you allow a 10% contingency fund for miscellaneous and incidental matters not thought of in making this estimate, the total cost then comes to about $1,165.

It would seem to the undersigned that for this expenditure you could nearly buy and install the spillway facility as outlined on the plan and still have in stock all of the concrete pipe you now have for other use on your farm.

I firmly believe that if you take prices for the construction of the dam as designed on the filed and approved plans and then take prices for the construction of the dam as altered with concrete pipe, you would still build the dam as cheap or cheaper if you follow the filed design.

If I can be of any further service to you at any time, please do not hesitate to call upon me.

Very truly yours

GHM/cmb

George H. McDonnell
County Hydraulic Engineer

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

Florek Dairy
Farm Dam

CIVIL.SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

TIGHE & BOND *CONSULTING ENGINEERS*

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Westfield
May 4, 1961

The Hon. the Board of County Commissioners
Hampden County Court House
Elm Street
Springfield, Massachusetts

Gentlemen:

The enclosed is a copy of a communication sent to Mr. Florek of the Florek Dairy, in Westfield, in connection with a conference held with him and a representative of the U. S. Soil Conservation Service on Tuesday morning at the site of a proposed dam on the Florek Dairy farm. Mr. Florek has on file with your Board approved plans and specifications for a dam. He wishes to change the spillway design and use materials he has on hand. The undersigned has pointed out to him that he will save nothing by using the materials on hand and may even increase the cost of his dam.

The contents of the letter discuss the matter in detail. I thought you might wish to have a copy of this for the file on this case.

Very truly yours

GHMcDonnell
George H. McDonnell
County Hydraulic Engineer

GHM/cmb

Foster Dam

1926 Westfield

Forest Dam located on Little River.

City/Town	Westfield
Dam	Foster Dam
Name	Foster Machine Company
Water	Little River

Page 70 of report.

Foster Machine Company,
Westfield, Mass.

you are notified that your dam, located on Westfield Little River so called in the City of Westfield, etc.

"There is some leakage around the bulkhead which should be repaired and some of the planking in the apron should be renewed. Otherwise, the structure is in fair condition for one of its type and age.

March 24, 1926

Foster Machine Company,
Westfield, Mass.

Gentlemen:

In accordance with the provisions of Section 45 of Chapter 253 of the General Laws as amended by Chapter 334 of the Acts of 1923 and as further amended by Chapter 178 of the Acts of 1924 relative to the inspection, condition and safety of the dams of Hampden County, you are notified that your dam, located on Westfield Little River so-called in the City of Westfield, has been inspected by our engineer and your attention is called to the following recommendations made by him;

> "There is some leakage around the bulkhead which should be repaired, and some of the planking in the apron should be renewed. Otherwise, the structure is in fair condition for one of its type and age."

Yours very truly,

COUNTY COMMISSIONERS

By____________________
Chairman.

____

____

J. O. McKEAN, PREST. E. T. FOWLER, TREAS. AND MANAGER. T. E. CONNOR, SALES MGR.

FOSTER MACHINE CO.

CONE WINDERS, TUBE WINDERS, DOUBLERS
BUILDERS OF
SPECIAL MACHINERY FOR ALL FIBERS.

WESTFIELD, MASS., U.S.A. March 25, 1926.

County Commissioners,
Springfield, Mass.

Gentlemen:-

Your favor of the 24th July received and we note that you have inspected our Dam located on Little River, Westfield, and that there are a few repairs needed.

We have planned to repair the Dam where necessary also bulk heads, the coming summer, which we trust will be entirely satisfactory to the Honorable Board.

Very truly yours,

FOSTER MACHINE COMPANY.
E. T. Fowler Mgr

ETF/B

May 17, 1933

Foster Machine Co.,
South Broad Street,
Westfield, Mass.

Gentlemen:

In accordance with the provisions of Section 45 of Chapter 253 of the General Laws as amended by Chapter 334 of the Acts of 1923 and as further amended by Chapter 178 of the Acts of 1924 relative to the inspection, condition and safety of the dams of Hampden County, you are notified that your dam, located on the Westfield Little River, in the City of Westfield, has been inspected by our engineer, and your attention is called to the following condition noted and recommendation made by him;

> "The dam proper is in fair condition. Attention is drawn however to some leakage from the canal at the bulk head that ought to be stopped."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By________________________
Chairman.

____

____

J. O. McKEAN, PREST. E. T. FOWLER, TREAS. AND MANAGER. T. E. CONNOR, SALES MGR.

FOSTER MACHINE CO.

CONE WINDERS, TUBE WINDERS, DOUBLERS
BUILDERS OF
SPECIAL MACHINERY FOR ALL FIBERS.

CABLE ADDRESS.
"CONETUBE" WESTFIELD, MASS.
CODES:
WESTERN UNION – A.B.C. 5TH EDITION
BENTLEY'S COMPLETE PHRASE CODE

WESTFIELD, MASS., U.S.A.

May 22nd, 1933.

Commonwealth of Massachusetts,
County of Hampden,
Springfield, Mass.

Gentlemen:

Your letter of the 17th received, and we note that you have recently inspected our water power dam, and you found that same was leaking somewhat under the bulk head.

We immediately inspected the bulk head, finding that it was leaking somewhat, and has been to our knowledge for some little time, as we did not think that it would do very much damage. We intend to get the specifications of our structure at the dam, and look into the matter and see if the leak can be stopped.

It seems to us that there is no reason why we cannot take care of this satisfactorily to you.

We will write you again as soon as we have this trouble eliminated.

Trusting this will be satisfactory to you.

Yours very truly,
FOSTER MACHINE COMPANY.

J. O. McKean

President.

JOMK/R.

FOSTER MACHINE CO.

CONE WINDERS, TUBE WINDERS, DOUBLERS
BUILDERS OF
SPECIAL MACHINERY FOR ALL FIBERS.

W. C. CHISHOLM, PRESIDENT & TREAS.
A. B. ROOT, JR., VICE PRES. & GEN. MGR.
D. W. BRIDGMAN, VICE PRES.
E. C. CONNOR, SALES MANAGER

CABLE ADDRESS:
CONETUBE

WESTFIELD, MASS., U.S.A.

December 23, 1949

Mr. Thomas F. Sullivan, Chairman
County Commissioners
County of Hampden
37 Elm Street
Springfield, Massachusetts

Reference: Your Report December 21, 1949

Subject: Foster Dam on Little River

Dear Sir:

Your report of the above date is acknowledged, advising of the findings of your engineer on a recent inspection of our dam.

The condition he reports is known to us and, as a matter of fact, has been observed over a period of approximately two years.

During the summer of 1948 we made an investigation of this situation, we did certain repair work on the floor of the canal as a result of which the leakage from this source was stopped.

Some years ago the writer had considerable experience in the matter of these hydraulic structures and would be glad to talk with your engineer about the problem if he would call on us the next time he is in this vicinity.

Yours very truly,

FOSTER MACHINE CO.

A B Root Jr

A. B. Root, Jr.
Vice President & General Manager

ABR:hc

Copy of this letter sent to Tighe and Bond, Engrs, on January 3, 1950.

December 21, 1949

Foster Machine Company
Westfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam located on Little River has been inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him:

> "In a recent inspection of your dam on Little River a leak was found under the corner of the abutment between the canal and the dam. This leak appears to be of recent origin, and its cause should be investigated and the leak stopped."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By Thomas F. Sullivan
Chairman

Charles W. Bray

William F. Stapleton

FOSTER MACHINE CO.

WESTFIELD, MASS., U.S.A.

Copy

December 1, 1950

Commonwealth of Massachusetts
County Commissioners
County of Hampden
37 Elm Street
Springfield, Massachusetts

Reference: Your Letters December 21, 1949 and April 28, 1950

Gentlemen:

The repairs to the abutment at our dam, as referred to in the above letters, has been substantially completed by performing the following described work.

1) New gates of copper sulphate treated lumber have been installed.

2) A wooden timber wall on the north face of the canal adjoining the abutment, approximately 125 years old, has been replaced with a concrete wall and over the interior face of this wall, the floor of the canal, and the adjoining face of the abutment a 3-ply waterproof membrane was installed.

3) On top of this membrane, a 6" vertical layer of concrete has been poured on the vertical surfaces and a 4" layer of waterproof concrete on the bottom of the canal for a distance of 35 feet bring this work well below the abutment.

4) Around the outside face of the abutment we have installed a supplementary concrete wall to prevent future erosion of the soil under the abutment.

This has effectively reduced the seapage under the abutment to a point where we hope no future erosion will take place and we consider the job completed so far as your formal request is concerned.

We would appreciate it if an inspection of the dam might be made and we be advised that the work is acceptable as complying with your request and that such note be entered in your records.

Yours very truly,

FOSTER MACHINE CO.

s/ A. B. Root, Jr.

A. B. Root, Jr.
Vice President & General Manager

ABR:hc

FOSTER MACHINE CO.

CONE WINDERS, TUBE WINDERS, DOUBLERS
BUILDERS OF
SPECIAL MACHINERY FOR ALL FIBERS.

W. C. CHISHOLM, PRESIDENT & TREAS.
A. B. ROOT, JR., VICE PRES. & GEN. MGR.
D. W. BRIDGMAN, VICE PRES.
E. C. CONNOR, SALES MANAGER

CABLE ADDRESS:
CONETUBE

WESTFIELD, MASS. U.S.A.

December 1, 1950

Commonwealth of Massachusetts
County Commissioners
County of Hampden
37 Elm Street
Springfield, Massachusetts

Reference: Your Letters December 21, 1949 and April 28, 1950

Gentlemen:

The repairs to the abutment at our dam, as referred to in the above letters, has been substantially completed by performing the following described work.

1) New gates of copper sulphate treated lumber have been installed.

2) A wooden timber wall on the north face of the canal adjoining the abutment, approximately 125 years old, has been replaced with a concrete wall and over the interior face of this wall, the floor of the canal, and the adjoining face of the abutment a 3-ply waterproof membrane was installed.

3) On top of this membrane, a 6" vertical layer of concrete has been poured on the vertical surfaces and a 4" layer of waterproof concrete on the bottom of the canal for a distance of 35 feet bring this work well below the abutment.

4) Around the outside face of the abutment we have installed a supplementary concrete wall to prevent future erosion of the soil under the abutment.

This has effectively reduced the seapage under the abutment to a point where we hope no future erosion will take place and we consider the job completed so far as your formal request is concerned.

We would appreciate it if an inspection of the dam might be made and we be advised that the work is acceptable as complying with your request and that such note be entered in your records.

Yours very truly,

FOSTER MACHINE CO.

ABRoot Jr

A. B. Root, Jr.
Vice President & General Manager

ABR:hc

Copy of this letter
sent to George H. McDonnell,
County Hydraulic Engineer,
on December 4, 1950.

Mr. Root of the Foster Machine Company, Westfield, telephoned December 28, 1949 to say he will be away the next two days in case the County's Hydraulic Engineer was planning to go to Westfield to see Mr. Root in compliance with Mr. Root's letter dated December 23, 1949. Mr. Root has known the leak has been there for a couple of years and that it is not getting any worse. Would like to postpone the needed repairs until Spring.
He feels there is no immediate danger and that they are watching it. He will be pleased to see the County's Engineer any time after next Tuesday, January 3, 1950.

JAMES L. TIGHE
PHILIP E. BOND
TELEPHONE
HOLYOKE 5525

TIGHE & BOND
CONSULTING ENGINEERS
189 HIGH STREET
HOLYOKE, MASSACHUSETTS

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
WATER POWER
DAMS

February 6, 1950

Re: Letter of 12/23/49
from Foster Machine
Company

The Hon. The Board of County Commissioners
Hampden County Court House
Springfield, Massachusetts

Attn: Thomas F. Sullivan, Chairman

Gentlemen:

On January 26, 1950, the Foster Dam on Little River in Westfield was reinspected by the undersigned, in the company of A. B. Root, Jr., Vice-President and General Manager of the Foster Machine Company.

The leak referred to, in our report to the Board, was not serious and of an emergency nature, though it did warrant notification of the owner. The leak has not increased during the past few months, and it appears certain that repairs to the dam and wall foundation can be deferred until the summer months. In the meantime, Mr. Root and the undersigned will inspect the leak from time to time, to be certain that it does not increase in volume.

Very truly yours,

By
G. H. McDonnell
County Hydraulic Eng'r.

JAMES L. TIGHE
PHILIP E. BOND
TELEPHONE
HOLYOKE 5525

TIGHE & BOND
CONSULTING ENGINEERS
189 HIGH STREET
HOLYOKE, MASSACHUSETTS

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
WATER POWER
DAMS

April 26, 1950

The Hon. The Board of County Commissioners
Hampden County Court House
Springfield, Massachusetts

Attn: Thomas F. Sullivan, Chairman

Gentlemen:

Enclosed for your information and files is a copy of a letter sent to the Foster Machine Company in Westfield. The Company plans to use an area of land located below their dam on Little River as a borrow area for material to fill their canal. The undersigned inspected the area this past week to determine if the planned work would endanger the dam, abutment or canal spillway and wall.

The work, if carried out as planned, will not endanger existing structures. The letter is self-explanatory and since the Company does not plan any work on the dam proper, the preparation of plans and specifications and the filing of a petition with your Board would not be necessary.

The undersigned will inspect the work from time to time.

Very truly yours,

G. H. McDonnell
County Hydraulic Engineer

COPY

April 28, 1950

Foster Machine Company
South Broad Street
Westfield, Mass.

Attention: Mr. A. B. Root

Gentlemen:

This is to confirm my conversation with you on the 25th of April pertaining to the excavation of material from an area below the dam on Little River, and between Little River and your canal embankment.

It is planned by your company to excavate material from this described area, and to use the material in filling the existing canal. The existing canal is to be replaced by pipeline laid in the bed of the canal prior to the filling operation. Provided that the excavation work is not carried on to a depth below the natural grade of the river bed, and the limits of the borrow area do not approach within approximately 75 to 100 feet of the apron of the dam and the canal spillway, approval of the proposed borrow area is hereby given. Excavation on the upper end of the borrow area should not be carried below the elevation of the end of the apron of the dam.

Very truly yours,

By

G. H. McDonnell
County Hydraulic Engineer

COPY

Tighe & Bond

Consulting Engineers
189 High Street
Holyoke, Mass.

copy

December 11, 1950

Re: Letter from Foster Machine
Co., Westfield., Mass 12/1/50

The Hon. Board of County Commissioners
Hampden County Court House
Springfield, Mass.

Attention: Thomas F. Sullivan, Chairman

Gentlemen:

In reference to the letter from the Foster Machine Company of Westfield, Mass., dated December 1, 1950, we have made periodic inspections of the repair work required on their dam, and submit the following report:

The repairs to the Foster Machine Company's dam were started in the early part of summer and work has continued from time to time through the summer and fall months. The undersigned has inspected the repair work during various stages of construction and has found that the workmanship has been of good quality and the methods used satisfactory in all respects.

A final inspection was made on December 1, 1950, in the company of A. B. Root, Jr., Vice President and General Manager, and it was found that all work had been completed, and, though the leakage had not been completely stopped, the danger of materials being washed from under the abutment had apparently been eliminated.

The work as completed to date is acceptable and hereby approved.

Very truly yours,

G. H. McDonnell,
County Hydraulic Engineer

JAMES L. TIGHE
PHILIP E. BOND

TELEPHONE
HOLYOKE 5525

TIGHE & BOND
CONSULTING ENGINEERS
189 HIGH STREET
HOLYOKE, MASSACHUSETTS

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
WATER POWER
DAMS

December 11, 1950

Re: Letter from Foster Machine
Co., Westfield, Mass., 12/1/50

The Hon. The Board of County Commissioners
Hampden County Court House
Springfield, Mass.

Attention: Thomas F. Sullivan, Chairman

Gentlemen:

In reference to the letter from the Foster Machine Company of Westfield, Mass., dated December 1, 1950, we have made periodic inspections of the repair work required on their dam, and submit the following report:

The repairs to the Foster Machine Company's dam were started in the early part of summer and work has continued from time to time through the summer and fall months. The undersigned has inspected the repair work during various stages of construction and has found that the workmanship has been of good quality and the methods used satisfactory in all respects.

A final inspection was made on December 1, 1950, in the company of A. B. Root, Jr., Vice President and General Manager, and it was found that all work had been completed, and, though the leakage had not been completely stopped, the danger of materials being washed from under the abutment had apparently been eliminated.

The work as completed to date is acceptable and hereby approved.

Very truly yours,

By GHMcDonnell
G. H. McDonnell
County Hydraulic Engineer

FOSTER MACHINE CO.

CONE WINDERS, TUBE WINDERS, DOUBLERS
BUILDERS OF
SPECIAL MACHINERY FOR ALL FIBERS.

W. C. CHISHOLM, PRESIDENT & TREAS.
A. B. ROOT, JR., VICE PRES. & GEN. MGR.
D. W. BRIDGMAN, VICE PRES.
E. C. CONNOR, SALES MANAGER

CABLE ADDRES
CONETUBE

WESTFIELD, MASS., U.S.A.

February 13, 1951

Commonwealth of Massachusetts
County Commissioners
County of Hampden
37 Elm Street
Springfield, Massachusetts

Reference: Our Letter December 1, 1950 - Foster Dam on Little River

Gentlemen:

In the above letter we notified you that we had made certain repairs to the dam as requested in your letter of December 21, 1949 requesting that work be inspected and if found approvable that you would so advise us. Your County Hydraulic Engineer, Mr. G. H. MacDonald, inspected the dam at about that time and I presume had made his report and we are wondering if sufficient time has now elapsed to permit you to send us the report of acceptance which we previously requested.

Yours very truly,

FOSTER MACHINE CO.

A B Root Jr

A. B. Root, Jr.
Vice President & General Manager

ABR:hc

September 2, 1953

Foster Machine Company
So. Broad Street
Westfield, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam located on Little River in Westfield has been recently inspected by our Engineer, and your attention is called to the following conditions noted and recommendations made by him:

> "There is a large leak boiling up from the southerly corner of the left abutment of the dam. There is no sign of earth movement at the foundation, however. The pond behind the dam is very small since it is nearly silted completely. It is doubtful if the leakage would cause the loss of the dam or abutment. However the condition should probably be called to the owner's attention for his action if he so desires. Since very little water is ponded upstream of the dam, loss of the structure would not endanger lives and property downstream."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

COUNTY COMMISSIONERS

By____________________________
Chairman

____

____

FOSTER MACHINE CO.

CONE WINDERS, TUBE WINDERS, DOUBLERS

BUILDERS OF

SPECIAL MACHINERY FOR ALL FIBERS.

W. C. CHISHOLM, PRESIDENT & TREAS.
A. B. ROOT, JR., VICE PRES.
D. W. BRIDGMAN, VICE PRES.
E. C. CONNOR, SALES MANAGER

WESTFIELD, MASS., U.S.A.

CABLE ADDRESS:
CONETUBE

September 3rd, 1953.

Commonwealth of Massachusetts
County of Hampden
37 Elm Street
Springfield, Massachusetts

Gentlemen:-

This will acknowledge your letter of September 2nd regarding the condition of our dam on the Little River. This situation has been known to us some time, in fact, over the past several years, considerable work has been done by us in strengthening weaknesses and preventing further leakage.

As you probably know, this water supply is only tied into this plant as an auxiliary for our sprinkler system.

Yours very truly,

Foster Machine Company

W C Chisholm

W. C. Chisholm
President & Treasurer

WCC/B

copy of this letter mailed to
Geo. H. McDonnell
county Hydraulic Engineer

CD Westfield

Aug. 13, 1956

Foster Machine Co.
South Broad St.
Westfield, Mass.

Gentlemen:

In connection with your telephone request to this office regarding proposed improvements to Little River in the vicinity of your plant and downstream of your existing dam, please be advised that the work as described apparently will not come under County control insofar as sections 44 thru 50 of Chapter 253 of the General Laws are concerned. We are enclosing herewith a copy of these sections for your information and use.

Provided the work as contemplated does not alter or change your existing dam, its abutment or any part of this structure, and providing the work as contemplated does not impound water, the work can be carried on without the necessity of filing plans and specifications for approval by the County Commissioners.

If you have any question on this matter kindly call or write the undersigned.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mdb

Enclosure

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
STRUCTURAL ENGINEERING
ELECTRICAL ENGINEERING

TIGHE & BOND, INC.
CONSULTING ENGINEERS
BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
GEORGE H. McDONNELL
PHILIP W. SHERIDAN

DAMS & POWER INSTALLATIONS
HIGHWAYS & BRIDGES
HOUSING DEVELOPMENT
WASTE DISPOSAL

CD Westfield

Aug. 13, 1956

The Hon. The Board of County Commissioners
Hampden County Court House
Elm St.
Springfield, Mass.

Gentlemen:

The Foster Machine Co. of Westfield have contacted the undersigned regarding permission to do certain diking and channel cleaning and allignment in the Little River in the vicinity of their plant. The work as proposed will be downstream of their dam and, as described to the undersigned will not alter the dam in any way nor impound water.

Enclosed for your information and file is a copy of a letter sent to the Foster Machine Co. confirming our conversation on this subject.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mdb

Enclosure

Feb. 6, 1957

Foster Machine Company
So. Broad Street
Westfield, Mass.

Gentlemen:

In accordance with the requirements of Chapter 253 of the General Laws of the Commonwealth of Massachusetts, the County Hydraulic Engineer has made inspections of all of the dams in the City of Westfield, including your dam on Little River, just upstream from your manufacturing plant.

A portion of the report on your dam from the County Hydraulic Engineer is as follows:

"It would seem adviseable to replace broken and missing planks on the apron in the very near future in order to prevent more extensive maintenance being required at a later date. It is recommended that the condition of the broken and missing planking on the apron be called to the attention of the owner."

If you desire any further information on this matter, please do not hesitate to call upon us.

Very truly yours

BOARD OF COUNTY COMMISSIONERS

____

____

____

FOSTER MACHINE CO.

BUILDERS OF SPECIAL
TEXTILE WINDING MACHINERY
FOR ALL FIBERS

FOSTER

W. C. CHISHOLM
PRESIDENT & TREASURER
E. C. CONNOR
VICE PRES. & DIRECTOR OF SALES
CABLE ADDRESS: CONETUBE
WESTFIELD, MASS.
U. S. A.

February 22nd, 1957.

Board of County Commissioners
County of Hampden
37 Elm Street
Springfield, Massachusetts

Gentlemen:-

This has reference to your communication of February 6th relative to our Brush Dam on the Little River. We are quite aware of the present condition of the Dam and have through the years carried on a program of maintenance not only of the Dam, but of the canal leading to our reserve water supply.

Immediately after the hurricane and flood of 1955, we asked Anderson-Nichols & Company of Boston to make a flood damage control program survey for us. You may be sure that such maintenance along the Little River that is necessary to protect our interests is having our constant attention.

Yours very truly,

Foster Machine Company

W C Chisholm

W. C. Chisholm
President & Treasurer

WCC/B

Copy of this letter sent to Mr. McDonnell
on Feb.25,1957.

Nov. 27, 1957

Foster Machine Co.
South Broad Street
Westfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq of the General Laws, Tercentenary Edition, relative to the inspection, condition, and safety of the dams of Hampden County, you are hereby advised that your dam on Little River, just upstream from your Manufacturing Plant has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "This is a wooden dam located on Little River at a point just upstream from the Foster Machine Co. Plant. This structure is very low and does not impound a great quantity of water. There are a number of missing planks that should be replaced on the apron of this dam. A small leak was noted at the left abutment. This could be in connection with relief piping that was installed some years ago. It is recommended that the owner be notified of these two conditions."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

HAMPDEN COUNTY COMMISSIONERS

Chairman

FOSTER MACHINE CO.

BUILDERS OF SPECIAL
TEXTILE WINDING MACHINERY
FOR ALL FIBERS

FOSTER

W. C. CHISHOLM
PRESIDENT & TREASURER
E. C. CONNOR
VICE PRES. & DIRECTOR OF SALES
CABLE ADDRESS: CONETUBE

WESTFIELD, MASS.
U. S. A.

December 13th, 1957.

Board of County Commissioners
County of Hampden
37 Elm Street
Springfield, Massachusetts

Gentlemen:-

This will acknowledge your letter of November 27th reporting the inspection of our Brush Dam on Little River.

You may be sure that the proper upkeep of this dam to protect our interests is in our maintenance program, as is also, the canal leading to our water supply.

Yours very truly,

Foster Machine Company

W C Chisholm
B.

W. C. Chisholm
President & Treasurer

WCC/B

Copy of this letter mailed to Mr. McDonnell on
December 16, 1957.

Oct. 1, 1958

Foster Machine Company
South Broad Street
Westfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition, and safety of the dams of Hampden County, you are hereby advised that your dam on Little River, just upstream from your Manufacturing Plant has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "There are planks missing from the apron of this timber crib structure. These should be replaced in the near future. Some leakage still occurs under the left abutment but this does not appear serious and has occurred for some time. The pond behind the dam is nearly all filled with sand and silt. Consequently, very little water is stored above this dam."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

HAMPDEN COUNTY COMMISSIONERS

Chairman

GEORGE H. MC DONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON
TEL. JEFFERSON 3-3991

TIGHE & BOND
CONSULTING ENGINEERS
BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
SUPERVISION OF CONSTRUCTION AND OPERATION
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS

C D Westfield
Nov. 4, 1958

The Hon. the Board of County Commissioners
Hampden County Court House
Elm St.
Springfield, Mass.

Gentlemen:

Reference is made to the letter from the Foster Machine Co., dated Oct. 20, 1958, copy of which was submitted to me for any necessary action.

The undersigned met with W. C. Chisholm, President and Treasurer of the Foster Machine Co. on Monday morning, Nov. 3, 1958, in connection with the recommended work at the dam at this industrial plant.

Present at the meeting was the Plant Engineer and another member of the firm.

I explained to these representatives of the Foster Machine Co. that the work as recommended on their dam was not an absolute necessity but that in making inspections, any work of a maintenance nature that was thought advisable was always passed on to the dam owners for their information. The work recommended at the Foster Machine Co. dam is of a maintenance nature only and is not an absolute necessity. Mr. Chisholm was happy to be informed of this fact since the industry has little desire or need for the dam and consequently does not wish to spend any large sum of money in connection with its maintenance.

The dam impounds very little water since the volume behind the dam is nearly completely filled with sand and gravel. The dam as it exists does not present any danger to persons and property downstream.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/f

FOSTER MACHINE CO.

BUILDERS OF SPECIAL
TEXTILE WINDING MACHINERY
FOR ALL FIBERS

FOSTER

W. C. CHISHOLM
PRESIDENT & TREASURER
E. C. CONNOR
VICE PRES. & DIRECTOR OF SALES
CABLE ADDRESS: CONETUBE
WESTFIELD, MASS.
U. S. A.

October 20th, 1958.

Office of the County Commissioners
37 Elm Street
Springfield, Massachusetts

Attention Mr. Thomas F. Sullivan

Gentlemen:-

This has reference to your letter of October 1st regarding a recent inspection of our dam on Little River. I would like very much to have a meeting with your engineer at your convenience and when he is in this vicinity again, if you will let me know, I will make sure our plant engineer is available also.

Yours very truly,

W. C. Chisholm
B.

W. C. Chisholm
President & Treasurer
Foster Machine Company

WCC/B

Copy of this letter mailed to George H. McDonnell,
County Hydraulic Engineer, on October 21,1958.

CD Westfield
May 5, 1961

Donald Weinle, City Engineer
Municipal Building
Court Street
Westfield, Mass.

Dear Sir:

In regard to the failure of a section of the timber crib dam at the Foster Machine Company plant, I am enclosing herewith for your file and use, a copy of a letter sent to the County Commissioners on my inspection of the dam. The contents of the letter are self explanatory. No doubt the County Commissioners will write to the Foster Machine Company and advise that they must take some action to either repair or replace the dam or remove it from the stream in such a way that no danger will result to persons or property downstream.

Very truly yours

George H. McDonnell
County Hydraulic Engineer

GHM/cmb
enc.

May 10, 1961

Foster Machine Company
Westfield, Mass.

Att: George H. Gilpatric
Works Manager

Gentlemen:

Reference is made to your letter of April 28, 1961 regarding the failure of the Brush Dam, on Little River adjacent to your plant, over the weekend of April 22, 1961. The County Hydraulic Engineer was directed by our Board to make an inspection of the dam, to discuss the matter with you and to report back to our Board.

As the result of information provided our Board by the County Hydraulic Engineer it is recommended that the dam be either repaired, replaced or completely removed.

In your letter you asked whether or not the dam serves any purpose other than to supply auxiliary water to your company. According to our records there is no other purpose as of the present time. However, there might be certain rights in the dam held by others, particularly adjacent land owners and this Board would not necessarily know of these rights.

In the event that you do not retain the dam and make it safe, as owner of the structure, you would have the obligation to remove the dam and demolish the remains so that the structure would not endanger persons and property downstream. If left in the river, as now existing, it is possible that in time of high river flow, large sections of the dam would be washed downstream to be caught in or against bridge abutments and culverts. Under certain conditions the flow capacity in culverts or under bridges might be reduced to a point where water would be backed up to cause unnecessary flooding, property damage and roadway washouts.

May 10, 1961

It is the feeling of this Board that you should take the necessary action within a reasonable length of time to either properly repair the dam, replace it or remove it from the stream bed.

If the dam is to be repaired or replaced, plans and specifications for the proposed work must be filed with the County, prior to any construction work being done.

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours

BOARD OF COUNTY COMMISSIONERS

____

____

____

Foster Machine

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Westfield
May 10, 1961

The Hon. the Board of County Commissioners
Hampden County Court House
Elm St.
Springfield, Mass.

Gentlemen:

Donald Weinle, City Engineer of the City of Westfield, discussed the Foster Machine Co. dam with me when I met with him on other matters on Thursday, May 4, 1961. At that time I told Mr. Weinle that I would be inspecting the dam and submitting a report to you in connection therewith. I promised him at that time to provide him with a copy of my report to your Board so that he, as City Engineer, would be fully informed as to the status of this dam.

I am enclosing a copy of my letter of transmittal to City Engineer Weinle for your files and information.

Very truly yours,

G H McDonnell
George H. McDonnell
County Hydraulic Engineer

GHM/f

FOSTER MACHINE CO.
FOUNDED IN 1891
BUILDERS OF SPECIAL
TEXTILE WINDING MACHINERY
FOR ALL FIBERS
FOSTER
CABLE ADDRESS: CONETUBE
WESTFIELD, MASS.
U. S. A.

April 28, 1961

Board of County Commissioners
County of Hampden
37 Elm Street
Springfield, Massachusetts

Subject: Brush Dam

Gentlemen:

This is to inform the County Commissioners that over the weekend of April 22 the Brush Dam located on the Little River on the western edge of our property gave away in part, with the result that a large hole has appeared somewhat west of the center of the dam and, for all practical purposes, the function of the dam no longer exists.

As to whether or not this dam will be repaired has not been decided as yet and this letter is in the way of an inquiry as to what purpose this dam has other than to supply auxiliary water to Foster Machine Company.

In the event we do not repair the dam, what obligations, if any, do we have to completely demolish the remains of the Brush Dam.

Very truly yours,

FOSTER MACHINE CO.

George H. Gilpatric

George H. Gilpatric
Works Manager

GHG:hc

copy of this letter sent to Mr. George H. McDonnell, County Hydraulic Engineer, on May 1, 1961.

Westfield Sportmen's Club Dam fka Old Fuller Dam No 2

1949 Westfield

Located on Simmons Brook.

City/Town	Westfield
Dam	Westfield Sportsmen's Club Dam
Dam	Fuller Dam
Dam	Westfield Sportsman's Club Dam
Name	Fuller, Lewis
Name	Westfield Sportmen's Club
Water	Simmons Brook
Water	Fuller Pond

December 21, 1949

Mr. Lewis Fuller
660 Western Avenue
Westfield, Mass.

Dear Sir:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam located on Simmons Brook in Westfield has been inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him:

> "In a recent inspection made of the Fuller No. 2 Dam, so called, on Simmons Brook in Westfield, it was found that work was not progressing to repair the dam and form a pond. On the day of inspection no person was found working in the area. Plans for repair of the dam, together with the necessary specifications, should be submitted for approval before any more work is done on the dam or spillway."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By Thomas F. Sullivan
Chairman

Charles W. Bray

William F. Stapleton

Paragraph from Mr. G. H. McDonnell's letter
2/13/51

Westfield Sportsmen's Club
Old Fuller No. 2 Dam in Westfield

Inspections have been made of the new dam and spillway construction being carried on by the Westfield Sportsmen's Club at the old Fuller No. 2 dam in Westfield. The spillway of this dam had been completed in an unapproved manner and has since been torn down and is now under reconstruction for the second time. The work is progressing very slowly and the delay in the completion of the spillway is due entirely to the Contractor's failure to maintain a continuous construction schedule.

COPY

May 3, 1951

Westfield Sportsmen's Club
P. O. Box 56
Westfield, Mass.

Gentlemen:

At a recent inspection of your dam in Westfield, the undersigned found that the toe of the earth-fill portion of the dam is quite wet and soft, and that leakage of water through the dam at this point amounts to a considerable quantity. It is apparent that this leakage will not decrease of its own accord, and that steps must be taken to prevent washing out of the sand fill of the dam along the toe.

The portion of the dam where work must be done on the toe includes the right half of the toe adjacent to the land end of the dam and that portion of the toe adjacent to the left of the new spillway. These directions are based on a person standing on the dam and facing downstream.

It would seem that the work requires the addition of heavy material along the toe of the dam in the wet areas and for a distance up the slope of the dam for about 1/3 of the length of the slope. A blanket of washed gravel or crushed stone 1-1/2 to 2 inches in size should be spread over the areas to be weighted. The thickness of this blanket should be 6 to 8 inches. On top of this blanket run-of-the-quarry rip rap could be dumped and spread over the area of the toe. About 1 foot to 18 inches in thickness should be sufficient for this layer of rip rap. The purpose of the stone and rip rap is to prevent the washing out of the sand fill of the dam but still allow for the draining off of seepage through the dam.

Based on conditions as they now exist at the dam, this recommended work on the toe should be done immediately, and if it is impossible to complete it within a week or two, it might be advisable to lower the pond 2 or 3 feet and reduce the seepage through the structure, until such time as the toe can be weighted.

A fish screen has been installed upon the spillway. I find no notation on the plan calling for the installation of a fish screen. Since the screen that you have installed is of the simple vertical type, and greatly reduces the cross-section area of the spillway, it will be necessary to plan on removing this screen each year from October through April. Fish screens of the type you have installed are a danger to keep in place during the Winter and Spring months of the year.

Upon completion of the recommended work along the toe of the dam, and an agreement pertaining to the annual removal of the fish screen, the construction work can be given over-all approval and the dam accepted.

Very truly yours,

By
G. H. McDonnell
County Hydraulic Engineer

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
STRUCTURAL ENGINEERING

TIGHE & BOND, INC.
CONSULTING ENGINEERS
189 HIGH STREET
HOLYOKE, MASSACHUSETTS
GEORGE H. McDONNELL
PHILIP W. SHERIDAN

DAMS & POWER INSTALLATIONS
HIGHWAYS & BRIDGES
HOUSING DEVELOPMENT
WASTE DISPOSAL

CD

Oct. 20, 1955

The Hon. the Board of County Commissioners
Hampden County Court House
Elm Street
Springfield, Massachusetts

Gentlemen:

On Wednesday, October 19th, the undersigned met with Mr. Young, President of the Westfield Sportsmen's Club and with Mr. Richard Fuller and his brother, relative to the dam of the Westfield Sportsmen's Club on a tributary of Powder Mill Brook.

The meeting was held at the site of the dam and the advisability and methods to be used in repairing the dam were discussed.

The undersigned recommended a change in the spillway fish screens so that they would automatically fail at time of high water and the inclusion of a core wall along the entire length of the earth fill section of the dam at the right of the spillway. This core would be either driven steel sheets, a clay sand mixture or poured concrete.

It was agreed by those present at the meeting that Plans and Specifications of the proposed work would be prepared and filed with the County before any work is done to close the breach and pond water.

Very truly yours

GHMcDonnell

George H. McDonnell
County Hydraulic Engineer

GHM*cmb

CD-Westfield

Jan. 30,1956

The Hon. the Board of County Commissioners
Hampden County Court House
Springfield, Massachusetts

COPY

Gentlemen:

I have examined a Plan and a set of Specifications submitted for the repair of flood damage to the Westfield Sportman's Club Dam in Westfield. The Plan is on a single sheet entitled "Plan, Flood Damage Repairs, Fullers Pond Dam, Westfield Sportman's Club, Westfield, Mass." dated Jan. ~~22~~, 1956. This Plan was filed on Jan. 25, 1956.

The Specifications for the work are on three typewritten sheets and are under the general heading of "General Conditions" and "Construction Details". These Specifications were filed on Jan. 25, 1956.

Damage occurred thru the earth fill of the embankment at the right of the spillway section. It is proposed to close the breach in the earth fill by constructing a concrete core wall on solid foundation to a depth below the existing wall and to a height above the existing wall. The proposed core wall will be connected to the existing core wall on both sides of the breach. To prevent seepage under the core wall 3" lumber sheathing will be driven to an impervious strata if found desirable during construction. No mention is made of any treatment for this lumber sheathing or the type of sheathing to be used. The sheathing should be a proper material generally used for this purpose and it should be treated.

Upon completion of the concrete core wall it is planned to place a proper fill on both sides of the wall, the upstream fill being an impervious material and the downstream fill being an ordinary borrow.

It is also proposed to improve the imperviousness of the entire existing embankment located to the right of the spillway by adding a 24" thick layer of compacted impervious material on the upstream face of the existing embankment. This material will be protected from action of the water by an 8" thick layer of broken stone fill. The impervious blanket will be excavated and installed below the base of the dam embankment.

It is recommended that a layer of ordinary borrow or sandy gravel approximately 12" in thickness be placed between the impervious blanket and the broken stone fill as shown in the cross sections.

The existing fish screen is to be modified by hinging on hangers from the inside of the spillway bridge. Also, the height of the new screen shall be only 12". The proposed screen arrangement should be free at the bottom so that at time of high flow, should they be clogged with debris, they will automatically and freely swing out and upward with the force of the overflow water.

In summary then it is recommended lumber sheeting be proper material and be treated. It is also recommended that a 12" layer of proper granular material be placed between the impervious blanket and the broken stone fill on the upstream face of the dam embankment. Also, that the fish screen, as altered, be free swinging at all times.

Assuming that the minor changes as recommended herein will be complied with and that the construction work will be carried on in accordance with the Plan and the Provisions of the Specifications, it is recommended that the Plan and Specifications be approved.

Respectfully submitted

George H. McDonnell
County Hydraulic Engineer

GHM/cmb

CD Westfield

March 13, 1956.

The Hon. the Board of County Commissioners
Hampden County Court House
Springfield, Massachusetts

Gentlemen:

I have made a review of the dam at the Westfield Sportsman's Club in Westfield in view of their request for permission to reconstruct the structure and report hereas follows.

The dam is located westerly of Montgomery Road on a tributary to Powder Mill Brook known as Simons Brook. The location is approximately one thousand feet upstream from Montgomery Road at a point where the drainage area contributory is less than three-fourths of a square mile.

The dam that was breached in the flood of August, 1955 was reconstructed approximately five years ago in accordance with Plans and Specifications properly prepared and filed with your Board. The undersigned inspected the construction from time to time and was in close contact with the work and required the work to be done with approved materials and with good workmanship in accordance with the Plans and Specifications.

During the flood of August 1955 the dam was washed thru by breaching of the earthen section to the right of the spillway. It can be expected that when the breaching took place the time element involved must have been a considerable number of minutes. The Pond behind the dam was not large. Normal depth at the dam did not average more than 5 feet except directly behind the spillway section. The Pond was small in area and extremely shallow in the upstream half of its area. Consequently, when the release of the impounded water occurred, a number of minutes must have elapsed before the overflowing pond began to discharge at a major rate. Since the Pond was full to its brim at the moment of dam failure, the depth of water behind the dam probably averaged 8 to 9 feet in the very downstream section of the Pond area.

The released water passed thru flat land in reaching Montgomery Road. In this area the water must have spread out materially. The water passed Montgomery Road where a culvert then and now exists and discharged into Powder Mill Brook about a thousand feet East of the Road. During this length of travel East of the road the water was confined to a narrow and deep sandy valley.

It is natural to expect that erosion would occur in this valley during the storm, with or without the dam failure.

The water released from the dam then entered Powder Mill Brook and flowed southeasterly into the built-up portion of Westfield and thru the vicinity of the Sterling Radiator Company and State Highway Route 202.

Major damage caused by the water of Powder Mill Brook occurred in this built-up area.

Just upstream of the Sterling Radiator Company are located culverts under the railroad tracks of the NY., NH & H Railroad. It is of interest to note that at the Sterling Radiator Company area the drainage area of the brook is approximately 10 square miles and thus over 13 times larger than the drainage area behind the dam of the Westfield Sportsman's Club.

In reaching the built-up area of Westfield this water released from the dam was required to flow first, the distance to Montgomery Road, second, under and across Montgomery Road by means of the existing culvert, third, thru the deep valley approaching Powder Mill Brook, and fourth, after joining Powder Mill Brook, a distance of nearly 4,000 feet to the railroad embankment. It should be kept in mind, that when this released water joined Powder Mill Brook, it was being mixed with rushing storm waters from a drainage area many times larger than the drainage area of the failed dam.

From questioning persons in the vicinity of Route 202 in Westfield and Powder Mill Brook on the day of the flood, I have been told that the railroad embankment acted as a dam and impounded a large quantity of the Powder Mill Brook water. This could be a result of a culvert inadequate to meet the extreme intensity of the general storm runoff from the entire drainage area. Failure of this railroad embankment apparently occurred and thus released a high head of water onto and into the populated and developed valley of Powder Mill Brook immediately downstream. I have been told by observers that the wall of water approaching Route 202 at Powder Mill Brook was from six to ten feet in height. Some have indicated it was even higher. This is hearsay evidence, however.

In view of the hereinabove it can be seen how impossible it would be for the released water from the Westfield Sportsman's Club dam to cause any more than a swell which might be in the neighborhood of a foot or so at the downstream point where major damage occurred.

The proposed reconstruction of the Westfield Sportsmans Club dam as planned and specified is sound from an engineering and hydraulic basis. The dam would be repaired with a good cutoff wall, a

Mar.13,1956

The Hon. the Board of County Comm.
Springfield, Mass.

seepage blanket would be included and the fish screen used in the past would be rebuilt for automatic opening in time of flood flow.

Based upon the Plans and Specifications submitted for reconstruction of the Westfield Sportman's Club dam and considering all facts in the case and in the failure of the old dam, the undersigned recommends approval of the filed Plans and Specifications.

Respectfully submitted

George H. McDonnell
County Hydraulic Engineer

GHM/omb

Westfield Sportsmen's Club
Westfield Mass. 01085
June 2, 1965

County Commissioners,
County of Hampden
Commonwealth of Mass.
Springfield Mass.

Honorable Gentlemen :

I have been requested as a member of the Board of Trustess of the Sportsmen's Club to secure your permission or the permission of the County Engineer to place a flash board approximately 6 inches in height on the top of the dam of the club pond off of Furrowtown Road this city.

This request is based on the the needs of an abutter to our property who wishes to draw water from our pond to fill an irrigation pond on property belonging to him on which he raises crops and to also have enough water in his pond to water his cattle when this use is necessary.

Very Truly Yours,
John E. Ferriter, Sr.
128 Main St.
Westfield Mass. 01085

John E. Ferriter Sr,
Trustee

CD Westfield
June 24, 1965

Mr. John E. Ferriter, Sr.
128 Main Street
Westfield, Massachusetts 01085

Dear Sir:

Reference is made to my recent telephone conversation with you regarding a request to place a flashboard approximately 6" in height on the spillway of the dam forming the pond at Westfield Sportsmen's Club. Before a flashboard can be placed on this dam, it will be necessary to provide the County with a sketch and the design computations for the flashboard and the pins to be used in supporting the flashboard. The flashboard must be installed in a manner whereby the board will be washed out in time of flood flow and the full capacity of the spillway automatically made available.

The vertical distance from the normal water level in the pond to the top of the dam embankment is not very great. Any reduction in this vertical distance could endanger the dam in time of flood flow.

If it is decided by the Sportsmen's Club that a flashboard is desirable, please send the undersigned, at the above address, the preliminary sketches and computations for the installation. After I have reviewed them, it will then be necessary for you to file copies of each in final form, one copy being in ink on linen cloth, with the County Commissioners for their official action.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE
& BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEfferson 3-3991

CD Westfield
June 24, 1965

The Hon. the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen:

Reference is made to the communication dated June 2, 1965, received by your Board from Mr. John E. Ferriter, Sr. of Westfield, relative to a request for permission to install a flashboard on the Westfield Sportsmen's Club Pond dam.

I have discussed this matter via telephone with Mr. Ferriter and explained to him the problems involved if a flashboard is to be installed on the spillway of the dam in question. I have confirmed the advice given Mr. Ferriter in a communication and enclose herewith a copy for your information and files.

Very truly yours,

George H McDonnell

George H. McDonnell
County Hydraulic Engineer

GHM/mb

Enc.

COPY

Commonwealth of Massachusetts

County of Hampden

Springfield, Mass.

Office of the
County Commissioners
52 State Street

William J. Stapleton
Chairman
Ralph P. Walsh
Lloyd W. Fradet

September 4, 1968

Westfield Sportsmen's Club
Montgomery Road
Westfield, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam in Westfield located off of Montgomery Road has recently been inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "This dam does not appear to be receiving the same quality of maintenance as in past years. The right spillway section is partially blocked with logs and debris. These should all be cleared from the spillway.
>
> A large log in the pond at the shoreline on the end of the dam near the access road should be taken out of the pond so that it will not be washed against the spillway opening and plug the opening in time of storm flow conditions.
>
> Seepage thru the grouted rock filled spillway was noted to be about normal. Brush and small tree growth on the downstream slope of the embankment and along the toe of the embankment should be cut down.
>
> The shape of the embankment is satisfactory. The broken stone surfacing of the water side of the dam is in satisfactory condition. Water level in storage was at the crest of the spillway on the day of inspection. In the opinion of the undersigned, the dam was safe when inspected but needed the recommended maintenance and attention."

COPY

It is recommended that periodic maintenance be scheduled for the dam and that the work as advised by the County Hydraulic Engineer in his report be done in the very near future.

Any further information concerning this dam which you may desire will be furnished by this office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

____

____

____

[illegible]
[illegible]
[illegible]

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEfferson 3-3991

CD Westfield
March 18, 1969

Westfield Sportsmen's Club
Montgomery Road
Westfield, Massachusetts

Gentlemen:

Reference is made to your dam in the City of Westfield, and the fact that there now exists a heavy snow cover throughout Western Massachusetts. The water content of this snow cover, coupled with a warm spring rain could result in extremely heavy runoff conditions. Consequently, the Commissioners of Hampden County have directed that I advise you to be sure that the spillway facilities at your dam are clear of any obstruction and that you take all precautions necessary to protect your dam as well as persons and property downstream.

Be sure that the swinging metal rack is free to operate and that the spillway is clear of any and all debris.

If you have any question in connection with this matter, the undersigned can be reached at the above address and telephone number.

Very truly yours,

George H. McDonnell

George H. McDonnell
County Hydraulic Engineer

GHM/amd

Commonwealth of Massachusetts

County of Hampden

Springfield, Mass.

Office of the
County Commissioners
52 State Street

William F. Stapleton
Chairman
~~[illegible]~~
Floyd W. Fradet
Stephen A. Moynaha

December 10, 1969

Westfield Sportsmen's Club
Montgomery Road
Westfield, Massachusetts.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et. seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam in Westfield located off of Montgomery Road has recently been inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "On the day of inspection the pond was empty and the drain gate was open. The swinging fish screens were free and will operate properly.
>
> The embankment was observed to be in fair condition. The road across the top was okay.
>
> All brush growth should be cleared from the downstream embankment face and from the toe area. A good sod growth should be developed on the downstream face and on the toe area of the dam.
>
> The pond side slope was okay. The broken stone surfacing is serving very well.
>
> Some minor erosion was noted at the spillway grouted riprap. Repairs to the eroded areas should be made in the near future to prevent the need from more extensive and possibly more expensive repairs at a later date.

> In the opinion of the undersigned the dam is safe but the recommended maintenance work should be done by 1970".

The recommendations of the County Hydraulic Engineer regarding the development of a turf growth on the dam embankment and at the toe area should be followed. It is expected that all brush growth shall be removed early in 1970. Also, additional concrete grout shall be added to the spillway where erosion is eating away the original grout.

Any further information concerning this dam which you may desire will be furnished by this office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

WESTFIELD SPORTSMAN'S CLUB, Inc.
POST OFFICE BOX 56
WESTFIELD, MASSACHUSETTS 01085

January 21, 1970

Mr. Stephen A. Moynahan
Hampden Country Commissioners
52 State Street
Springfield, Mass.

Dear Mr. Moynahan:

This is to acknowledge receipt of your letter of December 10, 1969, regarding the dam located on the clubs property.

The pond was drained for two reasons. (1) To remove trash fish, and hopefully the algae and weeds. (2) To examine and repair the dam and surrounding area if necessary.

Please rest assured that the club is planning to make the necessary repairs in the spring of 1970 when weather permits.

Very truly yours,

Thomas S. Frisby
Thomas Frisby
Secretary

TS/lf

Commonwealth of Massachusetts

County of Hampden

Springfield, Mass.

Office of the
County Commissioners
52 State Street

William F. Stapleton
[redacted]
[redacted]
Floyd W. Fradet
Stephen A. Moynahan
Chairman

June 17, 1970

Westfield Sportsmen's Club
Montgomery Road
Westfield, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam in Westfield located off of Montgomery Road has recently been inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "The embankment forming this dam is in fair condition as to size and shape. The upstream surface is satisfactory. On the downstream surface, all brush growth should be cut down to ground level and a good growth of sod should be developed on the entire downstream face of the embankment.
>
> The toe area is quite wet but, this condition is normal at this dam.
>
> Water level in storage was at the crest of the spillway and was overflowing.
>
> No flashboards were on the crest. Both swinging bar racks were found to be in satisfactory condition.
>
> The road across the top of the embankment and the spillway bridge were satisfactory. Minor erosion of the concrete grouted rock spillway should be repaired this year. Repairs made now will be relatively inexpensive and will prevent the need for more expensive repairs at a later date.

> The owner of this dam should be directed to remove all brush growth from the downstream surface of the embankment and at the toe of the embankment.
>
> In the opinion of the undersigned, the dam is safe, but the recommended maintenance work is necessary."

Your attention is called to our communication of December 10, 1969, and to the recommendations contained in the County Hydraulic Engineer's Report set forth hereinbefore.

The maintenance work as recommended by the County Hydraulic Engineer must be done this year, particularly as relates to cutting of brush and the development of a good growth of sod on the downstream face of the embankment.

Any further information concerning this dam which you may desire will be furnished by this office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

____

____

____

Great River Dam fka Horton Dam aka Turner Falls Power & Electric Company Dam aka Westfield Dam n/k/a "Cobble Mountain Dam".

1938 Westfield

Dam located across the Westfield River. See also: Dams - Blandford - "Cobble Mountain Dam" - D02006.

City/Town	Westfield
Dam	Cobble Mountain Dam
Dam	Great River Dam
Dam	Horton Dam
Name	Turners Falls Power & Electric Company
Water	Westfield River

TO THE COUNTY COMMISSIONERS OF THE COUNTY OF HAMPDEN:

The City of Westfield by its Mayor and Members of the City Council hereby petitions the County Commissioners for an examination of the dam across the Westfield River, known as Great River Dam or Horton Dam so-called, together with the abutment thereto.

Your petitioners believe and allege that said dam is partially destroyed, said dam being owned by the Turners Falls Power & Electric Co., and your petitioners believe that the dam is unsafe, in bad condition and a menace.

WHEREFORE, your petitioners pray that a thorough examination be made in the above matter.

Dated this ______ day of ______ 1938.

Signed: ______________________________ Mayor

____

____

______________________________ Members

______________________________ Of

______________________________ City

______________________________ Council

____

____

____

____

____

October 26,1938

Raymond H. Cowing, Mayor,
City of Westfield,
Mass.

Dear Mayor:

We are enclosing herewith draft form of petition endeavoring to follow the language of the statutes.

We trust the same will aid you not only in the enclosed matter but also in the Cobble Mountain Dam.

You will of course date them the same date as on the original petition.

It will be necessary to pay the regular $3.00 entry fee for each petition.

Very truly yours,

COUNTY COMMISSIONERS

By______________________
Counsel.

RWK/N

CITY OF WESTFIELD

October 18, 1938.

TO THE COUNTY COMMISSIONERS OF HAMPDEN COUNTY,
COUNTY COURTHOUSE,
SPRINGFIELD, MASS.

In accordance with the provisions of Section 45 of Chapter 253 of the General Laws application is hereby made for a thorough examination of the so-called Cobble Mountain dam in the Town of Blandford and the dam across the Westfield River in the City of Westfield, formerly known as the Horton dam.

Signed: Raymond H. Cowing Mayor
George E. Brady
Ernst F. Buschmann
Chas J. Ilks
Robt C. Loomis
Clarence H. Fuller
James A. Atwater
Arthur R. Long
Edward E. Knox
Herbert H. Thorpe

Members
Of
City
Council

October 19, 1938

Mr. James L. Tighe,
189 High Street,
Holyoke, Mass.

Dear Mr. Tighe:

The County Commissioners will hold a conference next Wednesday, October 26th, at 11 A.M. in the Commissioners' Office on the matter of Cobble Mt. Dam and the dam across the Westfield River in the City of Westfield, formerly known as the Horton Dam.

We would appreciate your presence at this conference.

Very truly yours,

COUNTY COMMISSIONERS

By ______________________
Chairman.

TJC/N

October 19,1938

Mayor Raymond H. Cowing,
City of Westfield,
Mass.

Dear Mayor:

The County Commissioners will hold a conference next Wednesday, October 26th, at 11 A.M. in the Commissioners' Office on the matter of Cobble Mt. Dam and the dam across the Westfield River in the City of Westfield, formerly known as the Horton Dam.

We would appreciate your presence at this conference, also, bring as many of the petitioners as you desire.

Very truly yours,

COUNTY COMMISSIONERS

By____________________
Chairman.

TJC/N

October 19,1938

Elbert E. Lochridge, Chief Engineer,
Water Department,
City of Springfield, Mass.

Dear Sir:

The County Commissioners will hold a conference next Wednesday, October 26th, at 11 A.M. in the Commissioners' Office on the matter of Cobble Mt. Dam and the dam across the Westfield River in the City of Westfield, formerly known as the Horton Dam.

We would appreciate your presence at this conference.

Very truly yours,

COUNTY COMMISSIONERS

By_______________________
Chairman.

TJC/N

October 19, 1938

C.F.Mosher, Gen. Supt.,
Turners Falls Power & Electric Co.,
Turners Falls, Mass.

Dear Sir:

The County Commissioners will hold a conference next Wednesday, October 26th, at 11 A.M. in the Commissioners' Office, Court House, on the matter of Cobble Mt. Dam and the dam across the Westfield River in the City of Westfield, formerly known as the Horton Dam.

We would appreciate your presence at this conference.

Very truly yours,

COUNTY COMMISSIONERS

By____________________
Chairman.

TJC/N

October 19,1938

Hearing was today set for next Wednesday morning at 11 on the petition of the mayor and city council of Westfield for an investigation into the Cobble mountain and Great river dams in that city.

The petition was presented to the county commissioners this morning by Mayor Raymond H Cowing and Supt of Public Works Orrin E. Parks of Westfield, and the county board announced that James L Tighe, expert engineer for the county, and Chief Engineer Elbert E. Lochridge of the Springfield Water dpeartment, will be present and give full information. Chairman Thomas JCostello and Commissioners Cahrles W Bray and Margaret V Donahue of the county board were present at the regular weekly meeting today when the petition was presented.

Mayor Cowing said that the city of Westfield was desirous of being fully reassured relative to the situation involging the two dams. It is desired that the Great river dam be taken out altogether and a large dike built to make the place safe. During recent floods a building of the Turner Falls company on North Elm street was undermined. Interest in flashbo of the Cobble Mountain dam was also expressed. It is likely that the Westfield residents will be fully reassured by expert testimone whi will be given next Wednesday.

rule

Mayor:

Councilmen -
Beard, Geo. E.) Special
Toombs, Robt. C.) Committee
Ely, Chas. F.
Supt of Public Works
Parks, Chas. E.
City Treasurer & Collector
McCarthy, Richard P.
Chamber of Commerce
Hall, P. N. (Secy)
Ensign, Wm. E. (Special Comm.)
Banks -
Kittle, Chas. J. (Hamp. Nat. Bk.)
Reed, Spencer (West. Sav. Bk.)

Others?

October 26, 1938

Horse Pond Dam

1956 Westfield

Establishment of Right of Way for public access to Forest Lake. Also see: Horseshoe Pond Dam.

City/Town	Westfield
Dam	Horse Pond Dam
Streets	River Street
Streets	Route 202
Water	Horse Pond
Water	Buck Pond
Water	Pequot Pond
Water	Forest Lake
Water	Hampton Ponds

WESTFIELD SPORTSMAN'S CLUB, Inc.

Post Office Box 58 56

WESTFIELD, MASSACHUSETTS

Dear Scotty,

The best place we think would be for the right of way to Hampden Ponds would be

The south end of Pequot Pond opposite the Nu Show Boat next to Route #202.

Horse Pond would be next to the Nu Show Boat right on Route #202 and north end of the pond

Buck Pond I dont know right next to the road are no parking spots and a high bank but opposit is a level peace of land.

Yours Truly
Walt Bey

Brought in to Cty Comms'
Office on October 22, 1958
by James Dowds
31 Charpentier Blvd
Willimansett, Chicopee.

Mr. Foley talked with Mr. Dowds in large room.

COMMONWEALTH OF MASSACHUSETTS

Hampden, ss: County Commissioners' Meeting March 4, 1959

WHEREAS the General Court by an Act known as Chapter 472 of the year 1958 did provide for the establishment of a right of way for public access to Horse Pond in the City of Westfield and of an area for the parking of vehicles contiguous to said right of way, and did further authorize and direct the County Commissioners of Hampden County to lay out said right of way and parking area; the said County Commissioners hereby give notice that they will meet for the purpose of viewing the premises and hearing all parties interested at the District Court of Western Hampden on Court Street in the City of Westfield on the 25th day of March next at 3:15 P.M.; and it is ordered by the Commissioners that a copy of this notice be served by the Sheriff of said County, or his Deputy, upon the Clerk of the City of Westfield in said County, fifteen days at least before the said 25th day of March and that all other persons and corporations interested therein be notified, by publishing a copy of this notice and this order thereon, twice in the Springfield Daily News and Springfield Union, and once in the Westfield Advertiser, public newspapers printed in said County, the last publication to be seven days at least before the time of said view and hearing, and that copies of this notice, or abstracts containing the sustance thereof and this order, be posted by said Sheriff or Deputy, in two public places in the City of Westfield seven days before said 25th day of March 1959.

Ralph L. Nash
Thomas F. Sullivan

County
Commissioners
of the County
of Hampden

March 6, 1959

Westfield Advertiser Inc.,
64 School Street,
Westfield, Mass.

Dear Sirs:

Kindly publish the enclosed notices (Buck Pond and Horse Pond, Westfield) in your newspaper on the following date:

March 12, 1959

Charge to County of Hampden and send newspaper to County Commissioners' Office, Court House, 37 Elm Street, Springfield, Mass.

Very truly yours,
HAMPDEN COUNTY COMMISSIONERS
By________________________
Chairman.

W/N
encls.

March 6, 1959

Springfield Union and Daily News,
Legal Advertising,
Fort Street,
Springfield, Mass.

Dear Sirs:

Kindly publish the enclosed notice (Horse Pond, Westfield) in the morning and evening editions on the following dates:

March 9th and 16th, 1959

Charge to County of Hampden and send newspapers to County Commissioners' Office, Court House, 37 Elm Street, Springfield, Mass.

Very truly yours,

HAMPDEN COUNTY COMMISSIONERS

By ______________________
Chairman.

W/N
encl.

COPY

THE COUNCIL OF SPORTSMEN'S CLUBS
of HAMPDEN COUNTY

March 30, 1959

Commissioners of
Hampden County
Hampden County Court House
Springfield, Mass.

Gentlemen;

At the march meeting of this organization the secretary was instructed to inform you of the recommendations of the body regards the proposed rights of way for public access to Forest Lake, Buck Pond and Horse Pond.

The sights for entrance and parking suggested at Buck Pond met with 100% approval. The proposed entrance and parking sights at Horse pond were considered adequate, provided that if entrance to Pequoit Pond was difficult or impracticle consideration would be given to a seperate entrance to that pond at a future date....under the proviso as set down buy the legislature.

The organization was not satisfied with the proposals made at the hearing at Forest Lake. The problem of going thru the culvert at summer low water plus the rank groth of weeds and pond lillys in the small pond (north side of river st.) plus the possible use of the areafor parking by other than fishermen and boat men makes this sight on the undesireable side. The council felt that an extention of fill on the right hand side of river st. wide enough for entrance and parking would be much more usefull.

We trust that you will give this latter your due consideration

very truly yours,

/s/ George E. Urban

George E. Urban, Sec.protem

Horseshoe Pond Dam aka Horse Pond Dam fka Cunningham Dam No. 4

1945 Westfield

Dam located at Hampton Ponds. Also see: Horse Pond Dam.

City/Town	Westfield
Dam	Cunningham Dam No. 4
Dam	Horseshoe Pond Dam
Dam	Horse Pond Dam
Name	Massachusetts Comm Public Works
Water	Hampton Ponds

HARRY GORDON
PHOTOGRAPHER & ILLUSTRATOR
316 HIGH STREET
PEOPLES' SAVINGS BANK BUILDING
HOLYOKE, MASS.

July 2,I945.

Hampden County Commissioners,
Springfield,Mass.

Gentlemen:

As a property owner at Hampton Ponds Westfield,Massachusetts,I would like to enter a complaint about a condition that exists there.

At the southerly end of Horseshoe Pond, an obstruction has been placed across the Spillway of the Dam,which is preventing the natural egress of water over the Spillway,which causes high water and is causing damage to my property.

I may say previous to the story published in the Holyoke Transcript of Fish being transferred by the Holyoke Fish & Game Club from Ashley Ponds to Hampton Ponds,the flow over the Spillway was natural.

If it is illegal for one to block a Spillway on State water,I think you ought to be made acquainted with the fact.

Yours very truly,
Harry Gordon.

Harry Gordon

PHOTOGRAPHERS ASSOCIATION OF AMERICA MEMBER

H.G:M.G.

July 3, 1945

Mr. Harry Gordon,
316 High Street,
Holyoke, Mass.

Dear Sir:

Your letter of July 2, 1945 has been received and we have referred the matter to our Hydraulic Engineer, Mr. James L. Tighe, and he will, no doubt, confer with you in regard to it.

Very truly yours,

COUNTY COMMISSIONERS

By____________________
Chairman

TJC/N

MEMBER
AM. SOC. C. E.
INST. C. E. GREAT BRITAIN
ENG. INST. OF CANADA

JAMES L. TIGHE
CONSULTING ENGINEER
CALEDONIAN BUILDING, 189 HIGH STREET
HOLYOKE, MASS.
TELEPHONE 5525
MEMBER AM. INST. OF CONSULTING ENGINEERS, INC.

MEMBER
BOSTON SOC. C. E.
ENG. SOC. WEST. MASS.
AM. & N. E. W. W. ASSOC'S

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
ANALYSIS OF WATER

WATER POWER INVESTIGATIONS
AND DEVELOPMENT
DAMS AND POWER INSTALLATIONS
ESTIMATES AND APPRAISALS

July 7, 1945

The Hon. The Board of County Commissioners
Hampden County, Court House
Springfield, Mass.

Thomas J. Costello, Chairman,

Dear Sir:

As requested I have examined the spillway of Hampton ponds, relative to some obstruction therein, which interferes with the free discharge of the water.

Hampton ponds are State Ponds, and consist of at least a half a dozen of natural bodies of water, of which Pequot pond and Horse pond are probably best known to the public. Horse pond, it seems, was raised some time in the past by the construction of an earthen embankment some 131 feet in length and 5 feet in height built across its natural outlet.

In this embankment was constructed a small masonry spillway some 3 feet in width and 3 feet in height or thereabouts.

It appears the obstruction therein, as complained of, was caused by a wire screen or netting set across the spillway which, with gradually accumulated debris thereon, obstructed the free discharge of the water.

On examination of the spillway it was found that the obstruction was partially removed, as the wire netting was broken or torn off at one end from its fastenings, and was hanging over the down stream face of the spillway. Unless, therefore, the wire netting is placed or set again across the spillway, the spillway will be a free water way.

It might not be out of place to state that all natural lakes and ponds in this region have high water because of the Spring high rainfall.

In conclusion I may state that I was unable to see Mr. Gordon as he was not at his office today.

Respectfully submitted,

James L. Tighe

July 11, 1945

Mr. Harry Gordon,
316 High Street,
Holyoke, Mass.

Dear Sir:

With reference to your letter of July 2, 1945 in regard to the spillway of Hampton Ponds and the obstruction therein, we have had our Hydraulic Engineer, Mr. James L. Tighe, investigate the conditions at Horse Pond, and the following is a copy of his report of the examination:

> "On examination of the spillway it was found that the obstruction was partially removed, as the wire netting was broken or torn off at one end from its fastenings, and was hanging over the down stream face of the spillway. Unless, therefore, the wire netting is placed or set again across the spillway, the spillway will be a free water way.
>
> It might not be out of place to state that all natural lakes and ponds in this region have high water because of the Spring high rainfall.
>
> In conclusion I may state that I was unable to see Mr. Gordon as he was not at his office today."

Hoping this is satisfactory, we are

Yours very truly,

COUNTY COMMISSIONERS

By________________________
Chairman.

TJC/N

Copy of this
letter sent
to James L.
Tighe on
July 19,1945.

HARRY GORDON
PHOTOGRAPHER ∞ ILLUSTRATOR
316 HIGH STREET
PEOPLES' SAVINGS BANK BUILDING
HOLYOKE, MASS.

Re-Spillway,Horsehoe Pond,Westfield,Mass.

July I6,I945.

Mr.Thomas J.Costello,Chairman,
County Commissioners,
Springfield,Mass.

Dear Sir:

Your letter of July IIth duly received.

Thank you for the interest you have shown in this matter.

I may say previous to Mr.James L.Tighe's investigation,in addition to the wire netting accross the Spillway,an old boat was filled with stones and sunk across the Spillway,completely stopping the egress of water.

Some person or persons removed the boat & partially tore down the wire netting.

As of Saturday July I4th,wire netting has been replaced,causing a lot of debris to gather there.

I quite agree with Mr.Tighe that all Ponds have high water caused by the heavy rainfall this Spring,but the mere fact of this Pond Spillway being blocked or partially blocked for the last three weeks has aggrevated the condition.

Thanking you.

Yours very truly,

PHOTOGRAPHERS ASSOCIATION OF AMERICA MEMBER

H.G:M.G.

Harry Gordon.

Harry Gordon

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
STRUCTURAL ENGINEERING
ELECTRICAL ENGINEERING

TIGHE & BOND, INC.
CONSULTING ENGINEERS
~~189 HIGH STREET~~
HOLYOKE, MASSACHUSETTS
GEORGE H. McDONNELL
PHILIP W. SHERIDAN

DAMS & POWER INSTALLATIONS
HIGHWAYS & BRIDGES
HOUSING DEVELOPMENT
WASTE DISPOSAL

→ NOTE: OUR NEW ADDRESS ←
BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS

CD - Westfield
July 11, 1956

The Hon. The Board of County Commissioners
Hampden County Court House
Springfield, Mass.

Gentlemen:

This week I received a complaint from Mr. Frank O'Neill, owner of property in Southampton on the shore of Hampton Ponds, regarding an excessive height of the water level in Hampton Ponds and requesting that the County take action to order the lowering of the level of Hampton Ponds to return the elevation of the water to a level claimed normal by Mr. O'Neill. I explained to Mr. O'Neill that under the laws of the Commonwealth your Board could only act in cases where the safety of a dam endangered persons and property downstream of the dam location and that an increased water level that flooded persons upstream, unless directly related to the safety of the dam, was a civil problem and one in which your Board of County Commissioners has no jurisdiction or power. I pointed out to Mr. O'Neill that the law has to do with damage caused by the breaking of a dam and the release of stored-up water.

On Tuesday evening, July 10, 1956, I inspected the small dam at the outlet of Hampton Ponds known as Horse Pond Dam and formerly known as Cunningham Dam #4.

This dam is now owned by the City of Westfield and the site of the dam is posted with a sign notifying all persons that the dam is the property of the City of Westfield and is under the jurisdiction of the Board of Public Works.

The dam is normal in its general condition and the spillway is in a good state of repair and maintenance. A stop log is in place in the spillway slot at about the same height as is normally observed at this dam. I am of the opinion that the spillway board is changed occasionally and that there may be a variation of a few inches in water level. At the present time, the height of the board in the spillway slot is 18 inches. The elevation of the top of this stop log is approximately the elevation of the top of the slot. Conditions at the dam insofar as water level is concerned, appear normal based on observation by the undersigned during the many inspections in recent years.

The condition of the dam is such that the structure is safe. This fact is borne out by the flood of 1955 when negligible damage was done to the dam during the heavy runoff of the flood water. The amount of water flowing over the spillway board on the 10th was negligible in height. Consequently, the level of Hampton Ponds, insofar as the dam is concerned, is governed by the top of the 18 inch stop log. The removal of this board or stop log from the spillway slot or the lowering of the top of this stop log by removal of the top portion would allow for a temporary increased rate of discharge from Hampton Ponds and a lowering of the water level. From an engineering viewpoint this lowering is not needed for the safety of the dam itself. However, if Mr. O'Neill and other property owners on the shore of Hampton Ponds feel that the water level is too high and wish to lower this water level, it is my opinion that they should request the Board of Public Works of the City of Westfield, owners of the dam, to remove the spillway board or stop log or to lower the elevation of this stop log to allow for less storage in Hampton Ponds.

Our file on Hampton Ponds indicates that on November 18, 1955, we reported to your Board regarding a complaint of high water and I believe that this complaint also came from Mr. O'Neill. In order that Mr. O'Neill might be fully informed of the fact that we have investigated each of his complaints and of the fact that the dam is safe and the problem is not one coming under the jurisdiction of the County Commissioners, it might be advisable to forward a copy of this letter or portions of this letter to Mr. O'Neill. Mr. O'Neill has a residence on Hampton Ponds in Southampton and I believe he can also be reached at 15 Longwood Avenue in Holyoke.

I will contact Mr. O'Neill again to view the shoreline at his property. However, this report regarding the dam is submitted at this time for your information.

Respectfully submitted,

George H. McDonnell
County Hydraulic Engineer

GHM/f

July 18, 1956

Mr. Frank O'Neill,
15 Longwood Avenue,
Holyoke, Massachusetts.

Dear Mr. O'Neill:

On several occasions I talked with our County Hydraulic Engineer George H. McDonnell regarding the water level in Hampden Ponds and your interest in the matter.

I enclose a copy of a report he has submitted to the County Commissioners and I call your attention to the suggestion he has made that you should request the Board of Public Works of the City of Westfield, owners of the dam, to remove the spillway board or stop log or to lower the elevation of the stop log to allow for less storage in Hampden Ponds. It seems that this would give you the desired water level.

Very truly yours,

HAMPDEN COUNTY COMMISSIONERS

By________________________
Chairman.

WFS/N
Encl.

Chapin Pond Dam
Westfield

Oct. 10, 1962

Board of Water Commissioners
Water Department
City Hall
Westfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam at Chapin Pond has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "The embankment of the dam needs brushing on the downstream side. Spillway bridge abutments are in poor condition. A high rate of discharge thru the spillway might cause further damage to the abutments and collapse of the bridge. Consideration should be given to improving these abutments in the near future. If new abutments are built, the distance between these abutments should be widened."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

____

____

____

COPY

CD Westfield
March 11, 1964

Water Department
City of Westfield
Municipal Building
Westfield, Massachusetts

Att: Leonard E. Phelon, Supt.

Gentlemen:

Your letter of March 6, 1964 has been received relative to the stone wall along the top of the dam at the Montgomery Reservoir.

I would be pleased to meet with your Board on Monday, April 20, 1964. April 20 is the first meeting night of your Board when my schedule is open. Unless I hear differently from you, I will be at the Water Department Office at 7:30 PM.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

cc: County Commissioners ✓
cc: Donald Weinle, City Engineer

August 5, 1964

Board of Water Commissioners
Water Department
Municipal Building
Westfield, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam at Chapin Pond has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "The embankment at this dam was found to be in fair condition. However, the stone riprap on the surface of the upstream face, particularly at the top of the dam, is in need of maintenance and repair. Brush on the downstream face of the embankment was not thick and apparently maintenance has been done to keep the growth down. Toe seepage was about normal.
>
> The bridge abutments at the spillway should be improved and the spillway channel kept clear and free of any debris or obstructions."

As recommended in previous years, it would be advisable for your Board to give consideration to the replacement of the spillway bridge abutments with a good grade of masonry, preferably poured concrete, and in doing the work, the distance between the abutments should be increased to provide a wide clear opening for the passage of flood flows.

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,
BOARD OF COUNTY COMMISSIONERS

August 5, 1964

Board of Water Commissioners
Water Department
Municipal Building
Westfield, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam at Tekoa Reservoir has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "The masonry forming this dam and spillway was found to be in good condition. Small tree growth and vegetation was noted at some of the masonry block joints, particularly just to the left of the spillway notch. This growth should be killed and removed before the roots do damage to the joints of the block construction. Water level in storage on the day of inspection was at the crest of the spillway. The paved chute just downstream and to the left side of the dam was in satisfactory condition."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

____

____

____

1/3

PW-H 65. 2

APPLICATION FOR PERMIT

July 22 1968

To the Department of Public Works,
100 Nashua St., Boston.

GENTLEMEN:

The undersigned, Leonard E. Phelon, Superintendent, Water Department of the City of Westfield, Massachusetts, hereby applies for permission to install by open cut a 12" Pipe across Southampton Road, Route 10/202 @ Buck Pond Road near Station 55+00. Top of pipe a minimum of 5' below roadway surface.

on the State highway in the City—~~Town~~ of Westfield, Massachusetts

Sign Here Leonard E. Phelon

Mailing Address
Superintendent
Water Department
59 Court Street
Westfield, Mass.

If this permit is to be issued to any one other than a municipality or utility company, the application must be signed by the owner of the property or said owner must indicate his approval of this application by signing below.

The Commonwealth of Massachusetts
Department of Public Works
DISTRICT #2 OFFICE
NORTH KING STREET, NORTHAMPTON 01060

August 1, 1968

SUBJECT: M-Permits
Rte. 10/202
Southampton Road
Westfield

City of Westfield
Water Department
59 Court Street
Westfield, Mass.

Gentlemen:

In accordance with field investigation and discussion by Mr. Don Weinle of your office and Mr. Perry of this office, your application for open cut installation of a twelve (12) inch pipe across State Highway at Buck Pond Road is being returned to you for reconsideration and resubmission.

You may decide to apply for crossing the highway by means of driving or jacking your pipe across without disturbing the paved surface.

You are further advised that applications should be submitted in duplicate and accompanied by sketch of your proposal.

Very truly yours,

FRANCIS J. HOEY
District Highway Engineer

GAP/bl
C - WPD

Encl.

City of Westfield, Massachusetts

WATER DEPARTMENT

MEMO

8 AUGUST 1968

TO: D. WEINLE, ENGRG. DEPT., CITY OF WESTFIELD

THE BOARD OF WATER COMMISSIONERS DESIRES TO APPEAL THE DECISION DISALLOWING AN OPEN CUT FOR THE WATER TRANSMISSION LINE AT THE INTERSECTION OF BUCK POND RD. AND SOUTHAMPTON RD.

REQUEST AN APPEAL BE FORWARDED TO THE COUNTY COMMISSIONERS FOR A REVIEW BASED ON ECONOMICS FOR THE PROGRAM AND IMMINENT RESURFACING.

I WILL BE AWAY FROM 10 AUG TO 17 AUG SO POSSIBLY YOU COULD WORK IT OUT WITH SUPT. PHELON AS WAS DONE PREVIOUSLY.

RESPECTFULLY,

Robert J. Kagnan SEC

Commonwealth of Massachusetts

County of Hampden

Springfield, Mass.

Office of the
County Commissioners
52 State Street

William F. Stapleton
Chairman
~~[illegible]~~
Floyd M. Fradet
Stephen A. Moynahan

October 1, 1969

Board of Water Commissioners
Westfield Water Department
Municipal Building
Westfield, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your Granville Reservoir Dam located in the Town of Granville has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "Granville Reservoir Dam Repair work on the spillway of this dam is continuing as of the most recent inspection. Grouting is being done under the spillway floor by the typical pressure method. As planned, the entire spillway area will be grouted where there is any evidence of cavities under the spillway floor. All cracks and broken wall and floor sections as well as eroded concrete will be properly dug out, prepared and then repaired or replaced.
>
> Water level in storage is relatively high this year, being 2 feet more or less below the masonry crest of the spillway. One set of flashboards was on the crest at the time of the last inspection.
>
> The shape of the embankment was o.k. On inspecting the downstream slope, one burrow hole was observed. This hole should be filled with compacted earth. Also, some of the grouted stone paving forming surface drainage ditches on the downstream face needs repair of broken concrete and displaced stones. The entire drainage ditch system on the downstream face should be examined and repairs made as needed.
>
> Surface depressions noted at the toe of the dam should be checked and corrected. These probably are related to the toe drainage system.
>
> The bridge to the gatehouse is to be re-planked. This work is apparently a part of the spillway repair and reconstruction work.

> Very little brush growth was noted on the embankment. The grass growth should be strengthened and improved by proper fertilization and the placing of seed where needed.
>
> The road across the top of the dam appeared to be satisfactory. There were no cracks of any concern, nor were there any settled or depressed areas.
>
> The upstream stone face of the embankment was satisfactory.
>
> In the opinion of the undersigned, the dam is safe. However, the owner should be advised to do the recommended maintenance and repair work on the downstream face of the dam embankment by carefully examining the face for burrow holes and plugging all burrow holes noted, by repairing the surface drainage system where the grouted stone paving has become dislodged and broken, and by investigating and correcting any of the sunken areas at the toe of the dam which may be related to loss of soil into the toe drainage system."

Our Board is pleased to see that repairs and improvements are being made at the spillway facility serving this dam. The recommended improvements to the embankment as pointed out in the report of the County Hydraulic Engineer should be made as soon as possible, preferably no later than the coming year.

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

____

____

____

Commonwealth of Massachusetts

County of Hampden

Springfield, Mass.

Office of the
County Commissioners
52 State Street

William F. Stapleton

Floyd M. Fradet
Stephen A. Moynahan
Chairman

June 17, 1970

Board of Water Commissioners
Westfield Water Department
Municipal Building
Westfield, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition; relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that dams under your control and jurisdiction, and located at Horse Pond at Hampton Ponds, at Chapin Pond and at Tekoa Reservoir, have been recently inspected by our engineer and your attention is called to the following conditions noted and recommendations made by him.

"Horse Pond Dam

The embankment forming this small dam was noted to be in fair condition. There is some small amount of brush growth on the surface of the embankment, and this should be cut down. The surface of the embankment should be covered with a good growth of turf.

At the right side of the spillway, there is a small area where turf and loam have been dug out of the embankment. The area should be repaired with compacted earth, and then loamed and seeded. Though the hole is small at the present time, it may become enlarged through erosion if it is not repaired.

The toe area of the small embankment was o.k.

The stone masonry spillway was found to be in satisfactory condition and water was overflowing the stoplogs. Water level was about 4" above the top of the upper stoplog, which in itself was at a grade just below the level of the side stone shelf. The water level in storage was observed to be 2" above the elevation of the right stone shelf of the spillway. The spillway opening is 48" in width.

The spillway channel at and downstream of the dam was satisfactory.

In the opinion of the undersigned, this dam is in satisfactory condition and is safe but needs attention and maintenance as noted hereinbefore."

"Chapin Pond Dam

The dam embankment was noted to be in fair condition. It is anticipated that brush growth will be quite heavy by summertime, and it should be cut down. A good turf cover should be developed on the downstream slope of the embankment and along the road shoulders at the top of the embankment.

The surface of the upstream slope needs to be repaired and graded at the area about opposite the large oak tree growing from the embankment.

The large oak tree itself should be cut down and the root system killed. Five other trees growing from the embankment and at the toe of the embankment should be cut down.

The spillway channel was found to be free of debris and was operating. The decking of the bridge over the spillway is becoming poor. New and proper abutments should be provided for the spillway bridge.

The irrigation suction pipe thru the embankment at the right end has been capped and was noted to be o.k.

The downstream toe of the embankment was found to be in satisfactory condition. It was a bit wet but the water was not moving.

The outlet end of the drainpipe thru the embankment was found to be in satisfactory condition.

In the opinion of the undersigned, maintenance work is necessary, as pointed out in the report, in order to keep the dam safe and in proper condition. The trees should be cut down, a good growth of turf should be developed, particularly on the downstream slope, and recommended repairs to the spillway bridge be made."

"Tekoa Dam

This stone masonry dam was found to be in satisfactory condition. Some seepage was noted thru the face of the spillway at the base of the dam in front of the gatehouse just above the paved toe drainage channel. The condition is satisfactory for now.

Some vegetation was observed to be growing from the face of the dam at joints in the stone masonry. This growth should be discouraged and the root system killed to prevent the roots from damaging the stone masonry.

Water level in storage was at the crest of the spillway channel section and was overflowing. The concrete spillway cap was noted to be in satisfactory condition. No flashboards were on the spillway.

The dam abutment areas were found to be o. k.

In the opinion of the undersigned, the dam is safe. However, the owner should be advised of the need to discourage the growth of brush and vegetation from the masonry joints of this stone dam."

It is essential for the protection of your investment in these dams, that the maintenance as recommended in the County Hydraulic Engineer's Report be done during this summer. Repair and maintenance work completed at an early date will prevent the necessity for much more expensive work at a later date.

Any further information concerning this dam which you may desire will be furnished by our office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

____

____

____

Smith Dam

- Westfield

Also see: Dam Report Section - Westfield.

City/Town	Westfield
Dam	Smith Dam
Name	Smith, Howard

WESTFIELD
D21015

HOWARD SMITH DAM

D21015

NO IMAGE ON FILE FOR THIS RECORD

(INFORMATION EXISTS ONLY ON A FILE CARD FROM THE OFFICE OF THE FORMER HAMPDEN COUNTY ENGINEER.)

Powder Mill Brook Dam aka John C Buschmann's Sons Tobacco Company Dam

1926 Westfield

Located on Powder Mill Brook. See also: "Powder Mill Brook Watershed" - D21023. See also: County Highways (Westfield) - "Powder Mill Brook Dam..." - ch03126.

City/Town	Westfield
Dam	John C Buschmann's Sons Dam
Dam	Powder Mill Brook Dam
Name	John C Buschmann's Sons Tabacco Company
Water	Powder Mill Brook

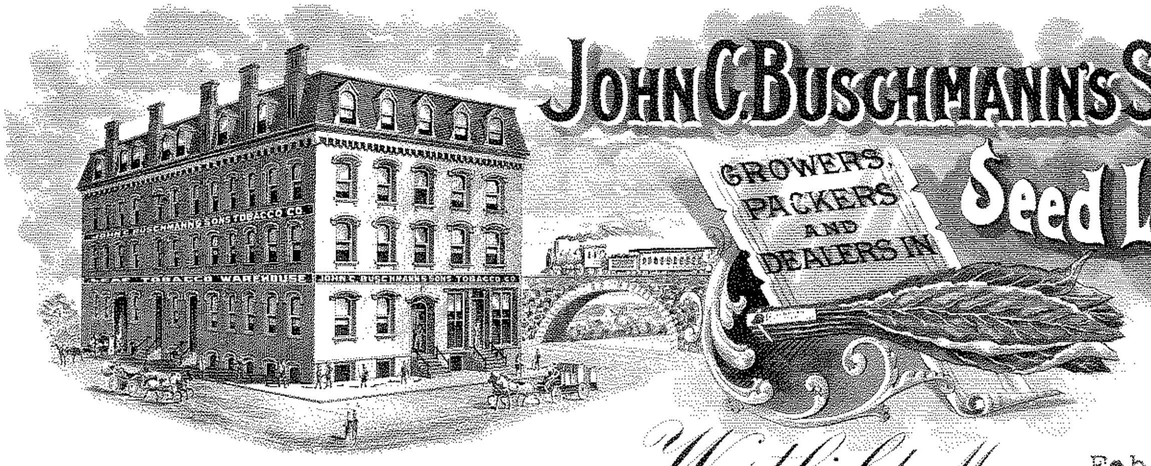
Page 73 of report

J. C. Buschman Sons Tobacco Company
Westfield Mass.

you are notified that your dam, located on Powder Mill Brook so called in the City of Westfield, etc.

The dam is in fair condition except for some erosion in the embankment at each end of the spillway. At these points the embankment should be filled in with gravel, and the trees growing on the upstream side of the dam cut down. The apron along the toe of the spillway should be replanked where some of the planking has been carried away or worn off, and the crest of the spillway cleared of the logs and debris accumulated thereon.

Now, therefore, etc.


JOHN C. BUSCHMANN'S SONS TOBACCO CO.
TOBACCO WAREHOUSE
JOHN C. BUSCHMANN'S SONS TOBACCO CO.

JOHN C. BUSCHMANN'S SONS TOBACCO CO.
GROWERS, PACKERS AND DEALERS IN
Seed Leaf Tobacco.
Near B. & A. R. R. Depot.

Westfield, Mass. Feb. 19, 1926. 19

Hon. Board of County Commissioners
Springfield, Mass.

Gentlemen:-

Replying to yours of the 17th. instant will say that when weather conditions become more favorable we will carry out your recommendations.

Yours very truly
John C Buschmann's Son Tob Co

February 17, 1926

J. C. Buschman Sons Tobacco Company,
Westfield, Mass.

Gentlemen:

In accordance with the provisions of Section 45 of Chapter 253 of the General Laws as amended by Chapter 334 of the Acts of 1923 and as further amended by Chapter 178 of the Acts of 1924 relative to the inspection, condition and safety of the dams of Hampden County, you are notified that your dam, located on Powder Mill Brook, so-called, in the City of Westfield, has been inspected by our engineer and your attention is called to the following recommendations made by him;

> "The dam is in fair condition except for some erosion in the embankment at each end of the spillway. At these points the embankment should be filled in with gravel, and the trees growing on the upstream side of the dam cut down. The apron along the toe of the spillway should be replanked where some of the planking has been carried away or worn off, and the crest of the spillway cleared of the logs and debris accumulated thereon."

Now, therefore, in accordance with Section 46 of said Chapter 253, it is ordered that the above recommendations be complied with in a reasonable time.

Yours very truly,

COUNTY COMMISSIONERS

By____________________
Chairman.

____

____

Littleville Dam

1962 Westfield

Large Dam located in the valley of Westfield River. See also Dams: D25105 & D25062. Very Important flood control dam.
See also: County Roads Plans #1 & #2- Russell -(1907) "Little River Missionary Dam" & "Little River Water Supply Contract No. 1 - Dam & Tunnel,l Westfield".

City/Town	Westfield
Dam	Littleville Dam
Name	U S Army Corps of Engineers
Name	U S A
Water	Westfield River

Littleville Dam
matter

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

March 22, 1962

The Hon. the Board of County Commissioners
Hampden County Court House
37 Elm Street
Springfield, Mass.

Gentlemen:

It is my understanding that the construction plans for the Littleville Dam have now been completed and are being distributed to contractors by the Corps of Engineers of the U.S. Government. As I recall, when the Corps of Engineers designed the reconstruction of dams damaged in the flood of August, 1955, copies of plans and specifications were submitted to your Board and filed in the usual manner.

If it is your opinion that copies of the plans and specifications should be filed in accordance with the General Laws of Mass., it is recommended that a communication be sent to the Corps of Engineers asking that plans and specifications of the Littleville Project be filed.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

March 28, 1962

U. S. Army Engineer Division, New England
Corps of Engineers
424 Trapelo Road
Waltham 54, Mass.

Att: Seymour A. Potter, Jr., Brigadier General USA
Division Engineer

Gentlemen:

It is our understanding that the Littleville Project located in the Valley of Westfield River has been designed and that construction plans and specifications are being distributed to contractors for the purpose of bidding the work.

Plans and specifications of all dams constructed in Hampden County are filed with the County for record purposes in accordance with the provisions of Chapter 253 of the General Laws of Mass.

Will you please provide our Board with two sets of the plans and specifications, one to be placed on file and to be the official record set, and the other to be used by the County Hydraulic Engineer in carrying out his work in the field and office.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

____

____

____

Serial No. CIVENG-19-016-62-49

CONNECTICUT RIVER FLOOD CONTROL PROJECT

SPECIFICATIONS

FOR

CONSTRUCTION

OF

LITTLEVILLE DAM

AND

APPURTENANT STRUCTURES

MIDDLE BRANCH, WESTFIELD RIVER

MASSACHUSETTS

15 March 1962

FACILITIES DESIGNED BY N.E.D.

VOLUME I OF III

Administrative Provisions
&
Technical Provisions
(Sections 1 - 14)

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND

CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS

NED NEW ENGLAND DIVISION

Wear Your HARD HAT

"a little care makes mishaps rare"

The Head You Save WILL BE YOUR OWN

U.S. ARMY CORPS OF ENGINEERS

TABLE OF CONTENTS

VOLUME I OF III

INVITATION FOR BIDS

BID FORM

PART I - GENERAL CONDITIONS

PART II - SPECIAL CONDITIONS

PART III - TECHNICAL PROVISIONS

Section No.	Title
1	PREPARATION OF SITE
2	CONTROL OF DIVERSION OF WATER
3	EXCAVATION - OPEN CUT
4	EXCAVATION - TUNNEL AND SHAFT - ITEMS 7 & 8
5	ROCK BOLTING
6	TUNNEL RIB SUPPORTS
7	EMBANKMENTS
8	ROCK SLOPE PROTECTION, SELECTED RIPRAP AND GRAVEL BEDDING
9	MISCELLANEOUS FILLS, ROADS, DRIVES, AND PARKING AREAS
10	CULVERT
11	FOUNDATION DRILLING AND GROUTING
12	TUNNEL GROUTING
13	ANCHOR BARS
14	CONCRETE

VOLUME II OF III

Section No.	Title
15	48-INCH WATER SUPPLY PIPE
16	WATER SUPPLY INTAKE TOWER AND FLOOD CONTROL GATE SHAFT - MISCELLANEOUS
17	FLOAT WELL AND AIR VENT
18	SLUICE GATES, VALVES AND ACCESSORIES
19	OMITTED
20	OMITTED
21	OMITTED
22	TRAVELING CRANES
23	DIESEL ENGINE-GENERATOR SET
24	VENTILATING SYSTEM, MECHANICAL
25	ELECTRICAL WORK; INTERIOR
26	HEATING SYSTEMS, FORCED-WARM-AIR: OIL-FIRED FURNACE
27	ELECTRICAL-EXTERIOR
28	STRUCTURAL STEEL BRIDGES
29	MISCELLANEOUS METAL ITEMS
30	METALS, MISCELLANEOUS MATERIALS AND STANDARD ARTICLES
31	METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS

VOLUME III OF III

Section No.	Title
32	TRENCH EXCAVATION AND BACKFILLING FOR UTILITIES, DRAINS AND CULVERTS
33	MISCELLANEOUS ITEMS OF WORK
34	UTILITY BUILDING, OPERATORS' QUARTERS AND GARAGE
35	PLUMBING, GENERAL-PURPOSE
36	HEATING SYSTEM; FORCED-HOT-WATER, OIL-FIRED
37	WATER SUPPLY WELLS
38	WATER AND SEWER SYSTEMS
39	OMITTED
40	PAINTING
41	BITUMINOUS CONCRETE PAVEMENT
42	BITUMINOUS SURFACE TREATMENT
43	TOPSOILING, SEEDING AND MULCHING

STANDARD FORM 20
JANUARY 1961 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

REFERENCE
Serial No. CIVENG-19-016-62-49

INVITATION FOR BIDS
(CONSTRUCTION CONTRACT)

DATE
15 March 1962

NAME AND LOCATION OF PROJECT
CONSTRUCTION OF LITTLEVILLE DAM AND APPURTENANT STRUCTURES, MIDDLE BRANCH WESTFIELD RIVER, MASSACHUSETTS

DEPARTMENT OR AGENCY
Department of the Army
Corps of Engineers

BY *(Issuing office)*
Division Engineer
U.S. Army Engineer Division, New England
424 Trapelo Road
Waltham 54, Mass.

Sealed bids in duplicate for the work described herein will be received until 2:00 p.m., E.S.T., 25 April 1962,

at the address of the Division Engineer, U.S. Army Engineer Division, New England, 424 Trapelo Road, Waltham 54, Mass.

and at that time publicly opened.

Information regarding bidding material, bid guarantee, and bonds

1. Bids may be mailed to: The Division Engineer, U.S. Army Engineer Division, New England, 424 Trapelo Road, Waltham 54, Mass.

2. In lieu of mailing, bids may be delivered in advance to: The Bids Receiving Desk, Building 109S at the above address. Just prior to the bid opening, bids may be delivered directly to the Contracting Officer in Bldg. 126 (Theater).

3. Bids will be opened at: Bldg. 126 (Theater), 424 Trapelo Road, Waltham 54, Mass.

4. Bids shall be submitted on Standard Form 21 (Bid Form-Construction Contract) and shall be prepared in accordance with Standard Form 22 (Instructions to Bidders). The bidder who is awarded the contract will be required to execute the standard contract form for construction contracts (Standard Form 23) attached hereto with Standard Form 23A, General Provisions, and supplement thereto, which set forth the contract clauses.

5. Bid Bond on U.S. Standard Form No. 24 in a penal sum of not less than 20% of the bid price or in a penal sum of $3,000,000, whichever is the lesser amount will be required with each bid if the bid price is in excess of $2,000. Failure to submit Bid Bond with bid will cause bid to be rejected.

Description of work The work consists of furnishing all plant, labor, materials, and equipment and performing all work in strict accordance with the specifications, drawings and schedules for the construction of dam, dike, concrete structures, buildings, and utilities as follows:

Specifications entitled: "CONSTRUCTION OF LITTLEVILLE DAM AND
APPURTENANT STRUCTURES, MIDDLE BRANCH,
WESTFIELD RIVER, MASSACHUSETTS
Drawings as listed in Paragraph SC-3 of the specifications.
Schedules as set forth in the Bid Form

BIDS MUST SET FORTH FULL, ACCURATE, AND COMPLETE INFORMATION AS REQUIRED BY THIS INVITATION FOR BIDS, INCLUDING ATTACHMENTS. THE PENALTY FOR MAKING FALSE STATEMENTS IN BIDS IS PRESCRIBED IN 18 U.S.C. 1001.

(ICB)

READ THE FOLLOWING IN CONJUNCTION WITH INSTRUCTIONS TO BIDDERS (U. S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS (Construction Contract)

1. Each bidder shall furnish a list of the plant available to the bidder and proposed for use on the work.

2. Bidders are required to acknowledge receipt of all amendments to this invitation on the Bid Form (Standard Form 21) in the space provided, or by separate letter or telegram prior to opening of bids. Failure to acknowledge all amendments may cause the bid to be considered not responsive to the invitation, which would require rejection of the bid.

3. If the bidder, by checking the appropriate box provided therefor in this bid, has represented that he has employed or retained a company or person (other than a full-time bona fide employee working solely for the bidder) to solicit or secure his contract, he may be requested by the Contracting Officer to furnish a completed Standard Form 119, "Contractor's Statement of Contingent or Other Fees for Soliciting or Securing Contract". If the bidder has previously furnished a completed Standard Form 119 to the office issuing this Invitation for Bids, he may accompany his bid with a signed statement, (a) indicating when such completed form was previously furnished, (b) identifying by number the previous invitation for bids or contract, if any, in connection with which such form was submitted, and (c) representing that the statements in such previously furnished form are applicable to this bid.

4. Modifications Prior to Date Set for Opening Bids. - The right is reserved, as the interest of the Government may require, to revise or amend the specifications and/or drawings prior to the date set for opening bids. Such revisions and amendments, if any, will be announced by an amendment or amendments to ths Invitation for Bids. Copies of such amendments as may be issued will be furnished to all prospective bidders. If the revisions and amendments are of a nature which require material changes in quantities or prices bid or both, the date set for opening bids may be postponed by such number of days as in the opinion of the Division Engineer will enable bidders to revise their bids. In such cases, the amendment will include announcement ment of the new date for opening bids.

5. The Government further reserves the right to make award on any or all schedules of any bid, unless the bidder qualifies such bid by specific limitation; also to make award to the bidder whose aggregate bid on any combination of bid schedules is low.

6. Repeal of Federal Transportation Tax on Property. - Section 4, Tax Rate Extension Act of 1958, (Act 30 June 1958, Public Law 85-475), in Part repealed the Federal excise tax on the transportation of property effective with respect to amounts paid for such transportation on and after August 1958.

Accordingly, any bid price(s) submitted hereunder which include freight charges should exclude any amount(s) for Federal excise tax on the transportation of property.

Wherein these instructions conflict with Clause 35 "Federal, State and Local Taxes", of the Supplement to General Provisions (Construction Contracts) S.F. 32A, March 1952 Edition, these instructions will govern.

7. Information Regarding Buy American Act. - Pursuant to the Buy American Act (41 U. S. Code 10 a-d), it is generally required that only domestic construction materials will be used in the performance of the contract (See Clause entitled "Buy American Act" of General Provisions of Standard Contract Form 23). This requirement does not apply to construction materials, or their components, included in the list set forth in paragraph 6-206 of the Armed Services Procurement Regulation or set forth below:

Antimony, as metal or oxide
Asbestos, amosite
Bismuth
Cadmium, ores and flue dust
Chalk, English
Chrome, ore or chromite
Cobalt, in cathodes, rondelles or other primary forms
Cork, wood or bark and waste
Damar gum
Graphite, natural, crystalline, crucible grade
Jute and jute burlaps
Kaurigum
Lac
Logs, veneer, and lumber from Alaskan yellow cedar, angelique balsa, ekki, greenheart, lignum vitae, mahogany, and teak
Mica
Nickel, primary, in ingots, pigs, shot, cathodes, or similar forms; nickel oxide and nickel salts
Rubber, crude and latex
Shellac
Tin, in bars, blocks, and pigs

Additional exceptions are permitted if the Government determines as to particular construction materials that the requirement would be impracticable or would unreasonably increase the cost. Therefore, bids or proposals proposing the use of nondomestic construction materials (other than those referred to above) may be eligible for award if such nondomestic construction materials are specifically designated in the bid or proposal and if accompanied by data demonstrating that, as to each such designated nondomestic construction material, use of any corresponding domestic construction material would be impracticable or would unreasonably increase the cost. If the Government determines that an exception from the Buy American Act should be made, an exception for the particular construction materials designated will be noted in the contract and the findings which justified the exception may be inspected upon request.

To show that the use of a particular domestic construction material would unreasonably increase the cost, accompanying data must show that the cost of any available acceptable domestic construction material, delivered at the construction site would exceed by more than six percent (6%) the cost of the designated nondomestic construction material delivered at the construction site (including any applicable duty.) The accompanying data shall reflect a thorough canvas of dealers and suppliers handling the construction materials involved.

8. Affiliated Bidders. - a. Business concerns are affiliates of each other when either directly or indirectly (i) one concern controls or has the power to control the other, or (ii) a third party controls or has the power to control both.

b. Each bidders shall submit with his bid an affidavit containing information as follows:

(i) whether the bidder has any affiliates;

(ii) the names and addresses of all affiliates of the bidder; and

(iii) the names and addresses of all persons and concerns exercising control or ownership of the bidder and any or all of his affiliates, and whether as common officers, directors, stockholders holding controlling interest, or otherwise.

READ THE FOLLOWING IN CONJUNCTION
WITH INSTRUCTIONS TO BIDDERS
(U. S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS
(Construction Contract)

9. Sets of drawings full size or reduced to half-size, and of specifications will be furnished upon receipt of payment of $10.00 per set. If individual plan sheets are requested, they will be furnished at the rate of $0.10 for half-size and $0.50 for full size for each sheet requested, but with a minimum charge of $1.00 except as provided for below. No refund of the payment for the drawings will be made and the drawings need not be returned to the Division Engineer. Additional copies of the specifications alone will be furnished an applicant at the rate of $1.00 per copy. Payments will be made by cash, check, or money order and delivered to the Finance and Accounting Officer, Corps of Engineers, Department of the Army, 424 Trapelo Road, Waltham, Mass. Checks and money orders should be made payable to "Treasurer of the United States". If the project is cancelled or no award is made under the invitation, upon request, refund of the payment for the plans and specifications will be made thereon upon return thereof to the issuing office, all charges prepaid.

10. Technical inquiries regarding the plans and specifications during the bidding period shall be made to the following:

Philip B. Thoresen, Waltham, Mass. TWinbrook 4-2400, Ext. 263

11. Reverse Signal Alarms. - See Paragraph SC-30 of the Special Conditions, relative to requirements for providing self-propelled construction equipment with reverse signal alarms.

12. Performance of Work by Contractor. - The contractor shall submit with his bid a description of the work that he will perform with his own forces, the percentage of the total work this represents, and the estimated cost thereof. See Paragraph SC-33 of the Special Conditions.

STANDARD FORM 21
JANUARY 1961 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

BID FORM
(CONSTRUCTION CONTRACT)

REFERENCE
Serial No. CIVENG-19-016-62-49

Read the Instructions to Bidders (Standard Form 22)
This form to be submitted in duplicate

DATE OF INVITATION
15 March 1962

NAME AND LOCATION OF PROJECT
CONSTRUCTION OF LITTLEVILLE DAM AND APPURTENANT STRUCTURES, MIDDLE BRANCH, WESTFIELD, MASSACHUSETTS

NAME OF BIDDER *(Type or print)*

(Date)

TO: Division Engineer
U. S. Army Engineer Division, New England
424 Trapelo Road
Waltham 54, Mass.

In compliance with the above-dated invitation for bids, the undersigned hereby proposes to perform all work for Construction of Littleville Dam and Appurtenant Structures, Middle Branch, Westfield, Massachusetts

in strict accordance with the General Provisions (Standard Form 23-A), Labor Standards Provisions Applicable to Contracts in Excess of $2,000 (Standard Form 19-A), specifications, schedules, drawings, and conditions, for the following amount(s)

See attached Unit Price Schedule

Affidavit made by the bidder concerning Parent Company and Employer Identification Number, attached hereto, forms a part of this bid.

Supplement to Bid Form, Sheets numbered 1 and 2, and Plant and Equipment Schedule, attached hereto form a part of this bid as does attached Unit Price Schedule.

The undersigned agrees that, upon written acceptance of this bid, mailed or otherwise furnished within calendar days (60 calendar days unless a different period be inserted by the bidder) after the date of opening of bids, he will within 10 calendar days (unless a longer period is allowed) after receipt of the prescribed forms, execute Standard Form 23, Construction Contract, and give performance and payment bonds on Government standard forms with good and sufficient surety.

The undersigned agrees, if awarded the contract, to commence the work within 30 calendar days after the date of receipt of notice to proceed, and to complete the work within * calendar days after the date of receipt of notice to proceed.

*For completion date or dates see Paragraph SC-1 of the specifications.

(Continue on other side)

Receipt of Amendments: The undersigned acknowledges receipt of the following amendments of the invitation for bids, drawings, and/or specifications, etc. *(Give number and date of each)*:

The bidder represents *(Check appropriate boxes)*:

(1) That he ☐ is, ☐ is not, a small business concern. *(For this purpose, a small business concern is a business concern, including its affiliates, which (a) is independently owned and operated, (b) is not dominant in its field of operation, and (c) had average annual receipts for the preceding three fiscal years not exceeding $5,000,000. For additional information see governing regulations of the Small Business Administration.)*

(2) (a) That he ☐ has, ☐ has not, employed or retained any company or person other than a full-time bona fide employee working solely for the bidder) to solicit or secure this contract, and (b) that he ☐ has, ☐ has not, paid or agreed to pay any company or person (other than a full-time bona fide employee working solely for the bidder) any fee, commission, percentage or brokerage fee, contingent upon or resulting from the award of this contract; and agrees to furnish information relating to (a) and (b) above as requested by the Contracting Officer.

(For interpretation of the representation, including the term "bona fide employee," see Code of Federal Regulations, Title 41, Subpart 1-1.5.)

(3) That he operates as an ☐ individual, ☐ partnership, ☐ joint venture, ☐ corporation, incorporated in State of

....

Enclosed is bid guarantee, consisting of

in the amount of

NAME OF BIDDER *(Type or print)*	FULL NAME OF ALL PARTNERS *(Type or print)* (with residental addresses)
BUSINESS ADDRESS *(Type or print)*	
BY *(Signature in ink. Type or print name under signature)*	
TITLE *(Type or print)*	

DIRECTIONS FOR SUBMITTING BIDS

Envelopes containing bids, guarantee, etc., must be sealed, marked, and addressed as follows:

Division Engineer
U.S. Army Engineer Division, New England
424 Trapelo Road
Waltham 54, Mass.

Bids may be delivered in advance to the Bids Receiving Desk in Bldg. 109S at above address, or delivered directly to the Contracting Officer in Building 126 (Theater) just prior to the bid opening.

CAUTION: Bids should not be qualified by exceptions to the bidding conditions.

PLANT AND EQUIPMENT SCHEDULE

Available Plant to be Used

Excavation Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Drilling Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Concreting Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Material Handling Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Add additional sheets if required.

PLANT AND EQUIPMENT SCHEDULE

Available Plant to be Used

Pumping Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Earth Embankment - Rolled Fills

Excavation and Transportation - Spreading and Rolling

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Add additional sheets if required.

PLANT AND EQUIPMENT SCHEDULE

Available Plant to be Used

Miscellaneous Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Add additional sheets if required

UNIT PRICE SCHEDULE

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
1	Preparation of Site	1	Job	L.S.	$
2	Control and Diversion of Water	1	Job	L.S.	
* 3	Unclassified Excavation - General	330,000	C.Y.	$	
* 4	Unclassified Excavation-- Borrow Area "B"	1,700,000	C.Y.		
* 5	Unclassified Excavation - Borrow Areas "C" and "E"	260,000	C.Y.		
* 6	Rock Excavation - General	122,000	C.Y.		
7	Rock Excavation - Tunnel	1,700	C.Y.		
8	Rock Excavation - Shaft	560	C.Y.		
* 9	Rock Excavation - Borrow	20,000	C.Y.		
*10	Line Drilling	14,000	S.F.		
11	Safety Mesh	6,000	S.Y.		
12	Rock Bolting	50	Ea.	$16.00	
13	Machine Cleaned Bedrock Surfaces	32,000	S.Y.	$	
14	Hand Cleaned Bedrock Surfaces	8,100	S.Y.		
15	Mortar for Foundation Preparation	200	C.F.		
*16	Compacted Impervious Fill	1,375,000	C.Y.		
17	Compacted Impervious Backfill	2,400	C.Y.		
*18	Compacted Random Fill - Dike	40,000	C.Y.		

*Estimated Quantities

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
*19	Compacted Random Fill - Dam and Miscellaneous	160,000	C.Y.	$	$
20	Omitted				
*21	Compacted Pervious Fill	75,000	C.Y.		
22	Compacted Gravel Backfill	2,500	C.Y.		
23	Omitted				
*24	Compacted Gravel Fill	19,000	C.Y.		
25	Omitted				
26	Omitted				
27	Omitted				
*28	Compacted Sand Fill	65,000	C.Y.		
29	Compacted Processed Sand Fill	6,500	C.Y.		
30	Omitted				
*31	Gravel Bedding	65,000	C.Y.		
32	Road Gravel	9,200	C.Y.		
33	Additional Rolling of Fill	1,000	Hrs.		
34	Omitted				
35	Omitted				
*36	Rock Slope Protection	141,000	C.Y.		
37	Selected Riprap	4,000	C.Y.		
38	Rock Blanket	1,000	C.Y.		

*Estimated Quantities

Item No.		Description	Quantity	Unit	Unit Price	Estimated Amount
39		Tunnel Drilling and Grouting				
	a.	Mobilization and Demobilization for Tunnel Drilling and Grouting	1	Job	$	$
	b.	Drilling Grout Holes	460	L.F.		
	c.	Drilling Drain Holes	100	L.F.		
	d.	Drilling Exploratory Holes	100	L.F.		
	e.	Portland Cement in Grout	500	C.F.		
	f.	Sand in Grout	500	C.F.		
	g.	Placing Grout, Contact Grouting	740	C.F.	$4.00	
	h.	Placing Grout, Consolidation Grouting	260	C.F.	$	
	i.	Connections to Grout Holes	25	Ea.	$5.00	
40		Foundation Drilling and Grouting				
	a.	Mobilization and Demobilization for Foundation Drilling and Grouting	1	Job	L.S.	
	b.	Drilling 1-1/2" (EX) Grout Holes	13,000	L.F.	$	
	c.	Drilling 3" (NX) Drain Holes	3,000	L.F.		
	d.	Drilling 3" (NX) Exploratory Holes	200	L.F.		
	e.	Portland Cement in Grout	3,600	C.F.		

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
	f. Sand in Grout	100	C.F.	$	$
	g. Placing Grout	3,700	C.F.		
	h. Connection to Grout Holes	800	Ea.	$5.00	
41	Omitted				
42	Anchor Bars, Type A - 10' Setting	300	Ea.	$	
43	Omitted				
44	Anchor Bars, Type B - 10' Setting	320	Ea.	$	
45	Concrete - Gravity Walls, Spillway, and Flood Control Outlet Portal	3,900	C.Y.		
46	Concrete-Lining Spillway and Flood Control Outlet Portal	1,170	C.Y.		
47	Concrete - Spillway Weir	1,700	C.Y.		
48	Concrete - Access Bridge Abutments	590	C.Y.		
49	Concrete - Walls, Weir and Trash Bars, Flood Control Intake Structure	430	C.Y.		
50	Concrete - Tunnel Lining	470	C.Y.		
51	Concrete - Tunnel Transitions	460	C.Y.		
52	Concrete - Flood Control Gate Shaft Lining to Elev. 564.5	350	C.Y.		
53	Concrete - Flood Control Gate Shaft Lining from Elev. 564.5 to Elev. 579.0	90	C.Y.		
54	Concrete - Flood Control Gate Shaft Superstructure	230	C.Y.		

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
55	Concrete - Water Supply Gravity Walls, Intake Channel and Outlet Portal	500	C.Y.	$	$
56	Concrete - Water Supply Diversion Conduit	3,700	C.Y.		
56A	Concrete - Water Supply Outlet Lining	40	C.Y.		
57	Concrete - Water Supply Intake Tower to Elev. 482	1,000	C.Y.		
58	Concrete - Water Supply Intake Tower from Elev. 482 to Elev. 581	1,020	C.Y.		
59	Concrete - Water Supply Intake Tower Superstructure above Elev. 581	250	C.Y.		
60	Concrete - Service Bridge Abutment and Piers	2,000	C.Y.		
61	Concrete - Bridge Superstructure	210	C.Y.		
62	Tunnel Rib Supports	65	Ea.		
63	Cement	30,000	Bbl.		
64	Steel Reinforcement	840,000	Lb.		
65	48-Inch Water Supply Pipe	1	Job	L.S.	
66	Rubber Waterstop - Type A	1,420	L.F.	$	
67	Rubber Waterstop - Type B	50	L.F.		
68	Flood Control Gate Shaft - Miscellaneous	1	Job	L.S.	
69	Water Supply Intake Tower - Miscellaneous	1	Job	L.S.	
70	Float Well and Accessories	1	Job	L.S.	
71	Air Vent and Accessories	1	Job	L.S.	

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
72	Tile Gages	1	Job	L.S.	$
*73	Miscellaneous Metals	23,000	Lb.	$	
*74	Structural Steel-Miscellaneous	13,100	Lb.		
75	Structural Steel Service Bridge	1	Job	L.S.	
76	Structural Steel - Access Bridge	1	Job	L.S.	
77	Aluminum	9,200	Lb.	$	
78	Heating and Ventilating Systems, Flood Control Operating House	1	Job	L.S.	
79	Gates and Accessories - Flood Control Gate Shaft	1	Job	L.S.	
80	Traveling Crane - Flood Control Operating House	1	Job	L.S.	
81	Diesel-Electric Generator Set	1	Job	L.S.	
82	Electrical Work, Interior, Flood Control Gate Shaft	1	Job	L.S.	
83	Heating System, Water Supply Intake Tower	1	Job	L.S.	
84	Gates and Accessories, Water Supply Intake Tower	1	Job	L.S.	
85	Traveling Crane - Water Supply Intake Tower	1	Job	L.S.	
86	Electrical Work, Interior, Water Supply Intake Tower	1	Job	L.S.	
87	Electrical Work, Exterior	1	Job	L.S.	
88	Cable Guard Rail	4,970	L.F.	$	
89	Guard Posts	24	Ea.		

*Estimated Quantities

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
90	Chain Link Fencing, 4 Feet High	2,200	L.F.	$	$
91	Precast Concrete Curb	370	L.F.		
92	Flagpole	1	Job	L.S.	
93	Log Boom	1	Job	L.S.	
94	Bituminous Concrete Surfacing	8,520	S.Y.	$	
95	Bituminous Surface Treatment	12,250	S.Y.		
96	Utility Building	1	Job	L.S.	
97	Operators Quarters	1	Job	L.S.	
98	Garage	1	Job	L.S.	
99	Water Supply Wells				
	a. Mobilization and Demobilization for Water Supply Well No. 1	1	Job	L.S.	
	b. Mobilization and Demobilization for Water Supply Well No. 2	1	Job	L.S.	
	c. Driving 8" Outer Casing	110	L.F.	$	
	d. Drilling 8" Hole Below 8" Casing	20	L.F.		
	e. Setting 6" Inner Casing	120	L.F.		
	f. Drilling 6" Hole, Uncased	370	L.F.		
	g. Drilling 6" Hole, Uncased, below depth of 250 feet	260	L.F.		
	h. Test Pumping Well	100	Hrs.		

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
100	Water Distribution System - Utility Building Area	1	Job	L.S.	$
101	Water Distribution System - Operators Quarters Area	1	Job	L.S.	
102	Sewage Disposal System - Utility Building Area	1	Job	L.S.	
103	Sewage Disposal System - Operators Quarters Area	1	Job	L.S.	
104	15-Inch Culvert	60	L.F.	$	
105	Class A Seedbed, Class A Seed	4,000	S.Y.		
106	Class B Seedbed, Class B Seed	19,000	S.Y.		
107	Class D Seedbed, Class B Seed	58,000	S.Y.		
			Total		$

NOTE 1: The work will be awarded as a whole to one bidder.

NOTE 2: Only quantities for items with an asterisk adjacent to Item No. are estimated quantities. (See Par. SC-7 of the SPECIAL CONDITIONS)

NOTE 3: Funds for construction of the Operator's Quarters are limited due to Congressional limitations. In the event the combined price bid by the lowest responsible bidder for Items 97 and 98 exceed the limitations, the Government reserves the right to eliminate Items 97, 98 and 101 from the work to be awarded. Award will then be made on the basis of evaluation of all bidders with the above Items 97, 98, and 101 eliminated.

NOTE 4: The bidder shall indicate below the type of cement or combination of cements he proposes to furnish (see Paragraph 14-02). One option only will be elected.

Portland cement ☐

Blend of natural cement and portland cement ☐

Portland blast furnace slag cement ☐

AFFIDAVIT

PARENT COMPANY AND EMPLOYER IDENTIFICATION NUMBER.

(a) Bidder represents that he ☐ is, ☐ is not, owned or controlled by a parent company. For this purpose a parent company is defined as one which either owns or controls the activities and basic business policies of the bidder. To own another company means the parent company must own at least a majority (more than 50 percent) of the voting rights in that company. To control another company such ownership is not required; if another company is able to formulate, determine or veto basic business policy decisions of the bidder such other company is considered the parent of the bidder. This control may be exercised through the use of dominant minority voting rights, use of proxy voting, contractual arrangements, or otherwise.

(b) If bidder is owned or controlled by a parent company, insert in the space below the name and main office address of the parent company.

______________________________	______________________________
Name	Address

(c) Bidder will provide in the applicable space below, if he has no parent company, his own Employer's Identification Number (E. I. No.) (Federal Social Security Identification Number used on Federal Tax Returns), or, if he has a parent company, the E. I. No. of his parent company.

Bidder's E. I. No.____________________

Parent Company's E. I. No.____________

SUPPLEMENT TO BID FORM
(Construction Contract)

If a bid or modification to a bid based on unit prices is submitted and provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price, including lump sum units, in the bid schedule must be stated or, if it is not stated, the bidder agrees that the lump sum adjustment shall be applied on a prorata basis to every unit price in the bid schedule.

In case of error in the extension of prices, the unit price will govern.

The bidder warrants that he has available or under his control plant of the character and in the amount required to complete the proposed work within the specified time.

It is hereby warranted that in the event award is made to the bidder, there will be furnished under this contract, or used in the performance of the work covered by this contract, only such unmanufactured articles, materials, and supplies as have been mined or produced in the United States and only such manufactured articles, materials, and supplies as have been manufactured in the United States substantially all from articles, materials, or supplies mined, produced or manufactured, as the case may be, in the United States, except as noted below or otherwise indicated in this bid or authorized in the invitation.

Mistakes in Bids. - The bidder hereby waives that portion of any alleged mistake or mistakes in his bid which falls within the following amounts:

If bid is $250,000 or less -- 5% of the bid;

If bid is more than $250,000 and less than $500,000 -- $12,500 plus 4% of the bid over $250,000;

If bid is $500,000 or more, and less than $1,000,000 -- $22,500 plus 3% of the bid over $500,000;

If bid is $1,000,000 or more -- $37,500 plus 2% of the bid over $1,000,000.

In cases where the allegation of mistake exceeds the above waived amounts and the request for correction is allowed, such amount will be excluded from the contract price; however, the amount waived as provided herein will not be deducted for the purpose of evaluating bids to determine the low bidder.

SUPPLEMENT TO BID FORM
(Construction Contract)

The above waiver does not apply to any clerical mistake which is obvious or apparent on the face of the bid including but not limited to (1) a mistake in the extension of a unit price or prices; (2) a mistake in totaling the sums of various bid items; (3) obviously misplaced decimal point or (4) failure to insert the unit price where amount intended can be determined from face of bid.

This clause is not applicable to allegations of mistakes which, if allowed, would result in a reduction in the bid price.

PART I

GENERAL CONDITIONS
(Index)

Paragraph No.	Paragraph Title	Page No.
GC-1	Scope of Work	GC-1
GC-2	Character of Work and Mechanics	GC-1
GC-3	Site Investigation	GC-1
GC-4	Operations and Storage Areas	GC-1
GC-5	Progress Charts, and Requirements for Overtime Work	GC-2
GC-6	Subcontractors	GC-3
GC-7	Quality of Articles, Materials and Equipment	GC-3
GC-8	Protection of Material and Work	GC-4
GC-9	Protection of Existing Structures, Utilities, Work and Vegetation	GC-4
GC-10	Possession Prior to Completion	GC-4
GC-11	Reserved	
GC-12	Labor Reports	GC-5
GC-13	Cleaning Up	GC-5
GC-14	Definitions	GC-5
GC-15	Bonds	GC-6
GC-16	Accident Prevention	GC-6
GC-17	Inspection	GC-7
GC-18	Items of Work	GC-7

9/29/60

PART I

GENERAL CONDITIONS

GC-1. SCOPE OF WORK. - The work to be performed under this contract consists of furnishing all plant, materials, equipment, supplies, labor and transportation, including fuel, power, water (except any materials, equipment, utility or service, if any, specified herein to be furnished by the Government), and performing all work as required in the statement of work in the contract, in strict accordance with the specifications, schedules, and drawings, all of which are made a part hereof, and including such detail drawings as may be furnished by the Contracting Officer from time to time during the prosecution of the work in explanation of said drawings.

GC-2. CHARACTER OF WORK AND MECHANICS. - The work shall be executed in the best and most workmanlike manner by qualified, careful and efficient mechanics in strict accordance with the drawings and specifications.

GC-3. SITE INVESTIGATION. - The contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work. The contractor further acknowledges that he has satisfied himself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Government as well as from information presented by the drawings and specifications made a part of this contract. Any failure by the contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Government assumes no responsibility for any conclusions or interpretations made by the contractor on the basis of the information made available by the Government. The Government also assumes no responsibility for any understanding or representations made by its officers or agents during or prior to the execution of this contract, unless (i) such understanding or representations are expressly stated in the contract and (ii) the contract expressly provides that the responsibility therefor is assumed by the Government. Representations which are not expressly stated in the contract and for which liability is not expressly assumed by the Government in the contract shall be deemed only for the information of the contractor.

GC-4. OPERATIONS AND STORAGE AREAS. - a. All operations of the contractor (including storage of materials) upon Government premises shall be confined to areas authorized or approved by the Contracting

Officer. No unauthorized or unwarranted entry upon or passage through, or storage or disposal of materials shall be made upon Government premises. Government premises adjacent to the construction will be made available for use by the contractor without cost whenever such use will not interfere with other Government uses or purposes. The contractor shall be liable for any and all damage caused by him to such Government premises. The contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature or kind arising from any use, trespass or damage occasioned by his operations on premises of third persons.

b. Temporary buildings (storage sheds, shops, offices, etc.), may be erected by the contractor only with the approval of the Contracting Officer, and shall be built with labor and materials furnished by contractor without expense to the Government. Such temporary buildings and/or utilities shall remain the property of the contractor and will be removed by him at his expense upon the completion of the work. With the written consent of the Contracting Officer, such buildings and/or utilities may be abandoned and need not be removed.

c. The contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways or construct and use such temporary roadways as may be authorized by the Contracting Officer. Where materials are transported in the prosecution of the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, state or local law or regulation. When it is necessary to cross curbings or sidewalks, protection against damage shall be provided by the contractor and any damaged roads, curbings, or sidewalks shall be repaired by, or at the expense of the contractor.

GC-5. PROGRESS CHARTS, AND REQUIREMENTS FOR OVERTIME WORK. - a. The contractor shall within 5 days or within such time as determined by the Contracting Officer, after date of commencement of work, prepare and submit to the Contracting Officer for approval a practicable schedule, showing the order in which the contractor proposes to carry on the work, the date on which he will start the several salient features (including procurement of materials, plant and equipment) and the contemplated dates for completing the same. The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion at any time. The contractor shall enter on the chart the actual progress at the end of each week or at such intervals as directed by the Contracting Officer, and shall immediately deliver to the Contracting Officer three copies thereof.

b. If, in the opinion of the Contracting Officer, the contractor falls behind the progress schedule, the contractor shall take such steps as may be necessary to improve his progress and the Contracting Officer may require him to increase the number of shifts, and/or overtime operations, days of work, and/or the amount of construction plant, and to submit for approval such supplementary schedule or schedules in chart form as may be deemed necessary to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost to the Government.

c. Failure of the contractor to comply with the requirements of the Contracting Officer under this provision shall be grounds for determination by the Contracting Officer that the contractor is not prosecuting the work with such diligence as will insure completion within the time specified. Upon such determination, the Contracting Officer may terminate the contractor's right to proceed with the work, or any separable part thereof, in accordance with the delays-damages article of the contract.

GC-6. SUBCONTRACTORS. - Within 7 days after the award of any subcontract either by himself or a subcontractor, the contractor shall deliver to the Contracting Officer a statement setting forth the name and address of the subcontractor and a summary description of the work subcontracted. The contractor shall, at the same time, furnish a statement signed by the subcontractor acknowledging the inclusion in his subcontract of Clause 21 of Standard Form 23A and all clauses set forth in Standard Form 19A. If, for sufficient reason, at any time during the progress of the work, the Contracting Officer determines that any subcontractor is incompetent or undesirable, he will notify the contractor accordingly and steps will be taken immediately for cancellation of such subcontract. Subletting by subcontractors shall be subject to the same regulations. Nothing contained in this contract shall create any contractual relation between the subcontractor and the Government.

GC-7. QUALITY OF ARTICLES, MATERIALS AND EQUIPMENT. - a. Where articles, materials and equipment are required to conform to standard specifications or tests of the Government or other authorities incorporated by reference, they will conform to the respective editions, including amendments, specified.

b. Any samples and descriptive data required shall -

(1) Be submitted within the time specified in these specifications or, if not specified, within a reasonable time before use to permit inspection and testing.

(2) Be shipped prepaid and delivered as specified in these specifications, or as directed by the Contracting Officer.

(3) Be marked to show the name of the material, trade name of manufacturer, place of origin, name and location of the project where the material represented by the sample is to be used, and the name of the contractor submitting the sample.

c. Samples not subjected to destructive tests may be retained until completion of the work but thereafter will be returned to the contractor, if he so requests in writing, at his own expense. Failure of any sample to pass the specified requirements will be sufficient cause for refusal to consider further any samples from the same manufacturer whose materials failed to pass the tests.

GC-8. PROTECTION OF MATERIAL AND WORK. - The contractor shall at all times protect and preserve all materials, supplies and equipment of every description (including property which may be Government-furnished or owned) and all work performed. All reasonable requests of the Contracting Officer to inclose or specially protect such property shall be complied with. If, as determined by the Contracting Officer, material, equipment, supplies and work performed are not adequately protected by the contractor such property may be protected by the Government and the cost thereof may be charged to the contractor or deducted from any payments due to him.

GC-9. PROTECTION OF EXISTING STRUCTURES, UTILITIES, WORK AND VEGETATION. - a. Any damage to existing structures or work of any kind, or the interruption of a utility service resulting from failure to comply with the requirements of this contract shall be repaired or restored promptly by or at the expense of the contractor.

b. The contractor will preserve and protect all existing vegetation such as trees, shrubs, and grass on or adjacent to the site which do not unreasonably interfere with the construction as may be determined by the Contracting Officer. The contractor will be responsible for all unauthorized cutting or damaging of trees and shrubs, including damage due to careless operation of equipment, stockpiling of materials or tracking of grass areas by equipment.

c. Care will be taken by the contractor in felling trees authorized for removal to avoid any unnecessary damage to vegetation that is to remain in place. Any limbs or branches of trees broken during such operations, shall be trimmed with a clean cut and painted with an approved tree pruning compound if required by the Contracting Officer. The contractor will be liable for or may be required to replace or restore at his own expense all vegetation not protected and preserved as required herein that may be destroyed or damaged.

GC-10. POSSESSION PRIOR TO COMPLETION. - The Government shall have the right to take possession of or use any completed or partially completed part of the work. Such possession or use shall not be deemed an acceptance of any work not completed in accordance with the contract.

If such prior possession or use by the Government delays the progress of the work or causes additional expenses to the contractor, an equitable adjustment in the contract price and/or the time of completion will be made and the contract shall be modified in writing accordingly.

GC-11. RESERVED

GC-12. LABOR REPORTS. - The contractor shall promptly furnish, and shall cause any subcontractors to furnish in like manner, within 7 days after the regular payment date of each weekly payroll, to the Contracting Officer, a copy of such payroll together with a statement of compliance with respect to the wages paid each of its employees (which shall not be deemed to apply to persons in classifications higher than laborers and mechanics and those who are the immediate supervisors of such employees) engaged on the work. If the contractor or any of his subcontractors fails to furnish copies of such payrolls, the Contracting Officer may disapprove all or part of any progress payment estimate for the period covered by such payrolls until they are received by him. The contractor shall also prepare and furnish such labor reports as may be required by the Department of Labor.

GC-13. CLEANING UP. - The contractor shall, at all times, keep the construction area, including storage areas used by him, free from accumulations of waste material or rubbish and prior to completion of the work remove any rubbish from the premises and all tools, scaffolding, equipment, and materials not the property of the Government. Upon completion of the construction, the contractor shall leave the work and premises in a clean, neat and workmanlike condition satisfactory to the Contracting Officer.

GC-14. DEFINITIONS. - a. Wherever in the specifications or upon the drawings the words directed, required, ordered, designated, prescribed, or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation or prescription of the Contracting Officer is intended and similarly the words approved, acceptable, satisfactory or words of like import shall mean approved by, or acceptable to, or satisfactory to the Contracting Officer, unless otherwise expressly stated.

b. Basic rate as used in Clause 2, "Eight-Hour Laws - Overtime Compensation", of Standard Form 19A means the basic hourly straight time wage rate actually paid laborers and mechanics and is not necessarily the same as the minimum hourly rate referred to in Clause 1, "Davis-Bacon

Act" of Standard Form 19A and in the paragraph of the specifications entitled "Rates of Wages".

GC-15. BONDS. - a. Payment Bond. - If the contract exceeds $2,000, the contractor agrees to furnish a payment bond with good and sufficient surety or sureties acceptable to the Government for the protection of persons furnishing material or labor in connection with the performance of the work under this agreement on U. S. Standard Form No. 25-A or U. S. Standard Form No. 27-A. The penal sum of such payment bond will be as follows: (1) When the contract price is $1,000,000 or less, 50 percent of the contract price; (2) When the contract price is in excess of $1,000,000, but no more than $5,000,000, 40 percent of the contract price; (3) When the contract price is more than $5,000,000, $2,500,000.

b. Performance Bond. - If the contract price exceeds $2,000, the contractor further agrees to furnish a performance bond with good and sufficient surety or sureties acceptable to the Government in connection with the performance of the work under this agreement on U. S. Standard Form No. 25 or U. S. Standard Form No. 27. The penal sum of such performance bond will be 100 percent of the contract price.

c. Any bonds required hereunder will be dated as of the same date as the contract and will be furnished by the contractor to the Government at the time the contract is executed.

GC-16. ACCIDENT PREVENTION. - a. In order to provide safety controls for protection to the life and health of employees and other persons; for prevention of damage to property, materials, supplies, and equipment; and for avoidance of work interruptions in the performance of this contract; the contractor will comply with all pertinent provisions of Corps of Engineers Manual, EM 385-1-1, dated 13 March 1958, entitled "General Safety Requirements," as amended, and will also take or cause to be taken such additional measures as the Contracting Officer may determine to be reasonably necessary for the purpose.

b. Prior to commencement of work, the contractor will -

(1) Submit in writing his proposals for effectuating this provision for Accident Prevention.

(2) Meet in conference with representative of the Contracting Officer to discuss and develop mutual understandings relative to administration of the over-all safety program.

c. During the performance of work under the contract, the contractor shall comply with all procedures prescribed by the Contracting

Officer for the control and safety of persons visiting the job site and will comply with such requirements to prevent accidents as may be specified under the SPECIAL CONDITIONS of these specifications or issued by the Contracting Officer.

d. The contractor will maintain an accurate record of, and will report to the Contracting Officer in the manner and on the forms prescribed by the Contracting Officer, exposure data and all accidents resulting in death, traumatic injury, occupational disease, and/or damage to property, materials, supplies and equipment incident to work performed under this contract.

e. The Contracting Officer will notify the contractor of any non-compliance with the foregoing provisions and the action to be taken. The contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the contractor or his representative at the site of the work, shall be deemed sufficient for the purpose. If the contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop order shall be made the subject of claim for extension of time or for excess costs or damages by the contractor.

f. Compliance with the provisions of this article by subcontractors will be the responsibility of the contractor.

GC-17. INSPECTION. - The work will be conducted under the general direction of the Contracting Officer and is subject to inspection by his appointed inspectors to insure strict compliance with the terms of the contract. No inspector is authorized to change any provision of the specifications without written authorization of the Contracting Officer, nor shall the presence or absence of an inspector relieve the contractor from any requirements of the contract. As soon as practicable after the completion of the entire work, or any divisible part thereof as may be designated in these specifications, a thorough examination thereof will be made by the Contracting Officer at the site of the work. If such work is found to comply fully with the requirements of the contract, it will be accepted; and final payment therefor will be made in accordance with the article of the contract entitled "Payments to Contractors."

GC-18. ITEMS OF WORK. - A brief description of each item and the estimated quantity thereof are shown in the schedule attached to the Bid Form and listed in the Statement of Work in the contract. Unless otherwise provided in the SPECIAL CONDITIONS, within the limit of available funds, the contractor will be required to complete the work specified herein in accordance with the contract and at the contract price or prices.

PART II

SPECIAL CONDITIONS
(Index)

Paragraph No.	Paragraph Title	Page No.
SC-1	Commencement, Prosecution and Completion of Work	SC-1
SC-2	Omitted	
SC-3	Contract Drawings and Specifications	SC-1
SC-4	Shop Drawings	SC-6
SC-5	Physical Data	SC-6
SC-6	Rates of Wages	SC-8
SC-7	Variations in Estimated Quantities	SC-9
SC-8	Government-Furnished Property	SC-10
SC-9	Omitted	
SC-10	Water	SC-10
SC-11	Electricity	SC-10
SC-12	Omitted	
SC-13	Layout of Work and Surveys	SC-11
SC-14	Payments for Mobilization and Preparatory Work	SC-12
SC-15	Damage to Work	SC-12
SC-16 to SC-23, Incl	Omitted	
SC-24	Funds Available for Payments	SC-13
SC-25 & SC-26	Omitted	
SC-27	Additional Supervision of Subcontracted Work	SC-15
SC-28	Scheduling and Determination of Progress	SC-15

Paragraph No.	Paragraph Title	Page No.
SC-29	Time Extensions	SC-16
SC-30	Reverse Signal Alarms	SC-16
SC-31	Omitted	
SC-32	Safety Nets	SC-16
SC-33	Performance of Work by Contractor	SC-17
SC-34	Contract Bid Breakdown	SC-17
SC-35	Temporary Heat	SC-17
SC-36	Omitted	
SC-37	Soils and Materials Control	SC-17
SC-38	Construction Sign	SC-18
SC-39	Safety Sign	SC-18
SC-40	Accident Prevention	SC-18
SC-41	Spare Parts Data	SC-19
SC-42	Guarantee	SC-20
SC-43	Operator's Quarters	SC-20
SC-44	Identification of Mechanized Equipment	SC-20
SC-45	Omitted	
SC-46	Project Bulletin Board	SC-20
SC-47	Certificates	SC-21
SC-48 & SC-49	Omitted	
SC-50	Deviations from Contract Requirements	SC-21
SC-51	Contractor's Options	SC-22
SC-52	Concrete Aggregate -- Approved Sources	SC-22
SC-53	Factors Affecting the Prosecution of the Work	SC-23
SC-54	Warning Signs	SC-23
SC-55	Plant	SC-23
SC-56	Blasting	SC-24

PART II

SPECIAL CONDITIONS

SC-1. COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK. - a. The contractor will be required to commence work under this contract within 30 calendar days after the date of receipt by him of notice to proceed, to prosecute said work with faithfulness and energy, and to complete the entire work ready for use not later than 900 calendar days after date of receipt by him of notice to proceed. The time stated for completion shall include final clean-up of the premises.

b. Time Extension for Topsoiling and Seeding. - In the event the contract completion date, as established in Subparagraph "a" above, is thirty (30) days or more after the limiting date established for seeding in the Technical Provisions herein, the contract completion date for topsoiling and seeding will be the last date of the next succeeding period specified as acceptable for seeding.

SC-2. OMITTED.

SC-3. CONTRACT DRAWINGS AND SPECIFICATIONS. - Twenty sets of contract drawings and specifications will be furnished the contractor without charge. Additional sets will be furnished on request at the cost of reproduction. The work shall conform to the following contract drawings and maps, all of which form a part of these specifications and are available in the office of the U. S. Army Engineer Division, New England Division, 424 Trapelo Road, Waltham, Massachusetts.

Drawing No.	Sheet No.	Title	Rev. No.
CT-1-5724	1	Project Plan and Index	
CT-1-5725	2	General Plan	
CT-1-5726	3	Hydrograph No. 1	
CT-1-5727	4	Hydrograph No. 2	
CT-1-5728	5	Hydrograph No. 3	
CT-1-5729	6	Hydrograph No. 4	
CT-1-5730	7	Hydrograph No. 5	
CT-2-1492	8	Plan of Foundation Explorations	
CT-2-1493	9	Dam & Dike - Geologic Sections	
CT-2-1494	10	Cut-Off Trench - Geologic-Log Section	
CT-2-1495	11	Water Supply Outlet Works - Geologic-Log Sections	
CT-2-1496	12	Flood Control Outlet Works - Geologic-Log Sections	
CT-2-1497	13	Spillway - Geologic-Log Sections	
CT-2-1498	14	Record of Foundation Explorations - No. 1	
CT-2-1499	15	" " " " - No. 2	
CT-2-1500	16	" " " " - No. 3	
CT-2-1501	17	" " " " - No. 4	
CT-2-1502	18	" " " " - No. 5	
CT-2-1503	19	" " " " - No. 6	
CT-2-1504	20	Plan of Borrow Explorations - Area B	
CT-2-1505	21	" " " " - Areas C,D,&E	
CT-2-1506	22	Record of Borrow Explorations - No. 1	
CT-2-1507	23	" " " " - No. 2	
CT-2-1508	24	" " " " - No. 3	
CT-1-5731	25	Embankment Sections	
CT-1-5732	26	Grouting Plan and Details	
CT-1-5733	27	Log Boom Details	
CT-1-5734	28	Dam and Dike Profiles and Rotary Details	
CT-1-5735	29	Dike Sections and Access Road	
CT-1-5736	30	Parking Area and Flag Pole Details	
CT-1-5737	31	Spillway - Plan and Sections	
CT-1-5738	32	" - Profile and Sections	
CT-1-5739	33	" - Weir-Sections	
CT-1-5740	34	" - West Wall - Plan, Elevations and Sections No. 1	
CT-1-5741	35	Spillway - West Wall - Plan, Elevations and Sections No. 2	
CT-1-5742	36	Spillway - East Wall - Plan, Elevations and Sections	
CT-1-5743	37	Spillway - East Retaining Wall - Plan, Elevations and Sections	
CT-1-5744	38	Flood Control Outlet Works - Plan and Profile	
CT-1-5745	39	Flood Control Intake Structure - Concrete Stairs	

Drawing No.	Sheet No.	Title	Rev. No.
CT-1-5746	40	Flood Control Intake Structure - Plan, Section and Detail	
CT-1-5747	41	Flood Control Intake Structure - Sections and Reinforcing Details No. 1	
CT-1-5748	42	Flood Control Intake Structure - Reinforcing Details No. 2	
CT-1-5749	43	Flood Control Tunnel and Transition - Sections and Reinforcing Details	
CT-1-5750	44	Flood Control Gate Shaft - Architectural - Plans and Elevations	
CT-1-5751	45	Flood Control Gate Shaft - Architectural - Sections and Details	
CT-1-5752	46	Flood Control Gate Shaft - Architectural - Entrance Details	
CT-1-5753	47	Flood Control Gate Shaft & Water Supply Tower - Architectural - Miscellaneous Details	
CT-1-5754	48	Flood Control Gate Shaft - Structural - Roof and Operating Floor Slabs - Reinforcing Details	
CT-1-5755	49	Flood Control Gate Shaft - Structural - Basement Floor Slab - Reinforcing Details	
CT-1-5756	50	Flood Control Gate Shaft - Structural - Superstructure - Elevations and Sections - Reinforcing Details	
CT-1-5757	51	Flood Control Gate Shaft - Structural - Platform, Stairs and Air Vent - Reinforcing Details	
CT-1-5758	52	Flood Control Gate Shaft - Structural - Vertical and Horizontal Sections - Reinforcing Details	
CT-1-5759	53	Flood Control Outlet Works - Structural - Miscellaneous Metals Details	
CT-1-5760	54	Flood Control Gate Shaft - Air Vents and Accessories	
CT-1-5761	55	Flood Control Gate Shaft - Mechanical - Plans, Sections and Details	
CT-1-5762	56	Flood Control Gate Shaft - Mechanical - Gate Assembly & Miscellaneous Details	
CT-1-5763	57	Flood Control Gate Shaft - Electrical - Plans and Section	
CT-1-5764	58	Flood Control Outlet Portal - Plan and Sections	
CT-1-5765	59	Flood Control Outlet Portal - Sections	
CT-1-5766	60	Water Supply - Plan and Profile	

Drawing No.	Sheet No.	Title	Rev. No.
CT-1-5767	61	Water Supply Intake Tower - Plan and Sections	
CT-1-5768	62	Water Supply Intake Tower - Retaining Walls	
CT-1-5769	63	Water Supply Intake Tower - Architectural - Plans and Details	
CT-1-5770	64	Water Supply Intake Tower - Architectural - Elevation and Section	
CT-1-5771	65	Water Supply Intake Tower - Architectural - Entrance Details	
CT-1-5772	66	Water Supply Intake Tower - Structural - Roof and Operating Floor Slabs - Reinforcing Details	
CT-1-5773	67	Water Supply Intake Tower - Structural - Heater Room and Gate Well Floor Slabs - Reinforcing Details	
CT-1-5774	68	Water Supply Intake Tower - Structural - Superstructure - Elevations and Sections - Reinforcing Details	
CT-1-5775	69	Water Supply Intake Tower - Structural - Platform and Stairs - Reinforcing Details	
CT-1-5776	70	Water Supply Intake Tower - Structural - Base Slab and Wall - Reinforcing Details	
CT-1-5777	71	Water Supply Intake Tower - Structural - Vertical Section No. 1	
CT-1-5778	72	Water Supply Intake Tower - Structural - Vertical Section No. 2	
CT-1-5779	73	Water Supply Intake Tower and Flood Control Gate Shaft - Structural - Miscellanelus Metals - Details No. 2	
CT-1-5780	74	Water Supply Intake Tower and Flood Control Gate Shaft - Structural - Miscellaneous Metals - Details No. 2	
CT-1-5781	75	Water Supply Intake Tower - Mechanical - Plans and Sections	
CT-1-5782	76	Water Supply Intake Tower - Mechanical - Gate Assemblies & Miscellaneous Details	
CT-1-5783	77	Water Supply Intake Tower - Electrical - Plans and Sections	
CT-1-5784	78	Water Supply Intake Tower - Float Well and Accessories	
CT-1-5785	79	Water Supply Intake Tower - Tile Gages	
CT-1-5786	80	Water Supply Conduit - Plan and Sections No. 1	
CT-1-5787	81	Water Supply Conduit - Plan and Sections No. 2	
CT-1-5788	82	Water Supply Conduit - Plan and Sections No. 3	
CT-1-5789	83	Water Supply Outlet Portal - Plan and Sections	

Drawing No.	Sheet No.	Title	Rev. No.
CT-1-5790	84	Electrical Distribution System - Plan and One Line Diagram	
CT-1-5791	85	Electrical Distribution System - Miscellaneous Details No. 1	
CT-1-5792	86	Electrical Distribution System - Miscellaneous Details No. 2	
CT-1-5793	87	Access Bridge Abutments - Plan and Details	
CT-1-5794	88	Access Bridge - Structural Steel Details No. 1	
CT-1-5795	89	" " " No. 2	
CT-1-5796	90	Access and Service Bridges - Structural - Bearing and Abutment Details	
CT-1-5797	91	Service Bridge - Structural Steel Details No. 1	
CT-1-5798	92	Service Bridge - Structural Steel Details No. 2	
CT-1-5799	93	Service Bridge - Structural - Piers and Abutment Details	
CT-1-5800	94	Goss Hill Road Improvement - Plan and Profile No. 1	
CT-1-5801	95	Goss Hill Road Improvement - Plan and Profile No. 2	
CT-1-5802	96	Goss Hill Road Improvement - Plan and Profile No. 3	
CT-1-5803	97	Goss Hill Road Improvement - Plan and Profile No. 4	
CT-1-5804	98	Maintenance Road - Profile, Sections and Details	
CT-1-5805	99	Utility Building - Site Plan	
CT-1-5806	100	Utility Building - Plans, Sections and Details	
CT-1-5807	101	Utility Building - Elevations and Details	
CT-1-5808	102	" " - Sections and Details	
CT-1-5809	103	" " - Structural Details	
CT-1-5810	104	" " - Plumbing and Heating	
CT-1-5811	105	" " - Electrical	
CT-1-5812	106	Operators Quarters - Site Plan	
CT-1-5813	107	Operators Quarters - Floor Plans, Elevation and Sections	
CT-1-5814	108	Operators Quarters - Framing Plans, Sections and Details	
CT-1-5815	109	Operators Quarters - Electrical Plan	
CT-1-5816	110	Operators Quarters - Plumbing and Heating	
CT-1-5817	111	Garage - Plans, Elevations, Sections and Details	

SC-4. SHOP DRAWINGS. - The contractor shall submit to the Contracting Officer for approval six (6) copies of all shop drawings as called for under the various headings of these specifications. These drawings shall be complete, shall be checked by the contractor prior to submission, and shall contain all required detailed information. If approved by the Contracting Officer, each copy of the drawings will be identified as having received such approval by being so stamped and dated. The contractor shall make any corrections required by the Contracting Officer. Four (4) sets of all shop drawings will be retained by the Contracting Officer and two sets will be returned to the contractor. The approval of the drawings by the Contracting Officer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the contractor of the responsibility for any error which may exist, as the contractor shall be responsible for the dimensions and design of adequate connections, details and satisfactory construction of all work. The submission by the contractor will be accompanied by ENG Form 4025, in sextuplicate. In addition, an information copy of this form, without inclosures, will be forwarded by the contractor to the Resident Engineer, Area Engineer, and Design Branch, Engineering Division, NED. ENG Form 4025 will be furnished to the contractor by the Government.

SC-5. PHYSICAL DATA. - Information and data furnished or referred to below are furnished for information only and it is expressly understood that the Government will not be responsible for any interpretation or conclusion drawn therefrom by the contractor.

a. The physical conditions indicated on the drawings and in the specifications are the result of site investigations by surveys and borings, test pits and foundation probes. Soil samples and rock cores obtained from the subsurface explorations made by the Government, field reports of explorations, records of water levels in observation wells, and results and data of all tests made by the Government on soil samples are available for examination and review at the Corps of Engineers Soils, Foundations and Frost Effects Laboratory, New England Division Headquarters, 424 Trapelo Road, Waltham, Mass. telephone TWinbrook 4-2400, Ext. 387. The results of laboratory tests, except those of permeability test, performed on soil samples obtained from subsurface explorations in the foundation areas of the embankments and structures are shown on Plate Nos. A-1 through A-18A (19 sheets), inclusive, inserted at the end of the SPECIAL CONDITIONS. The classification of soil samples is in accordance with Drawing No. NEDGL-61-5C, "Unified Soil Classification", attached at the end of the SPECIAL CONDITIONS.

b. Weather Conditions. - Weather conditions at the site of the work are approximately as indicated below. Complete weather records and reports may be obtained from the U. S. Weather Bureau. On the basis of records, the following weather information is listed for the convenience of the contractor.

Monthly Temperatures

(Degrees Fahrenheit)
Knightville Dam, Mass.
Elev. 630 ft. m.s.l.
Period of Record - 11 yrs.

Month	Mean	Maximum	Minimum
January	23.7	60	-24
February	26.2	63	-16
March	32.6	69	-14
April	45.6	84	10
May	55.3	90	23
June	64.9	99	32
July	70.1	99	40
August	67.2	100	38
September	59.0	100	24
October	49.8	88	17
November	38.0	81	2
December	27.7	61	-19
Annual	46.7	100	-24

Monthly Precipitation

(Depth in Inches)

Knightville Dam
Elev. 630 ft. m.s.l.
Period of Record - 19 yrs.

Chester, Mass.
Elev. 600 ft. m.s.l.
Period of Record - 44 yrs.

	Knightville Dam			Chester, Mass.		
Month	Mean	Max.	Min.	Mean	Max.	Min.
January	3.15	6.40	0.75	3.53	6.83	0.91
February	2.75	4.67	1.24	3.16	5.18	1.69
March	4.00	10.18	1.28	3.91	10.49	0.21
April	3.69	5.73	0.82	3.83	8.37	0.75
May	3.99	6.73	0.95	3.93	7.77	1.15
June	3.21	6.23	0.57	4.11	9.15	0.23
July	3.80	7.33	1.12	3.99	8.49	1.01
August	3.41	15.27	1.15	3.99	18.44	0.50
September	3.57	8.06	1.38	3.94	12.61	0.40
October	3.65	16.95	1.19	3.65	17.51	0.00
November	4.53	7.18	0.81	4.37	11.01	1.00
December	3.80	6.21	0.65	3.59	9.19	0.76
Annual	43.92	62.26	32.15	45.90	67.50	32.23

Mean Monthly Snowfall
(Average Depth in Inches)

Month	Knightville Dam Period of Record - 12 yrs.	Chester, Mass. Period of Record - 20 yrs.
January	12.00	13.34
February	12.55	14.14
March	13.47	10.16
April	4.63	1.92
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	0	0
November	2.16	4.15
December	6.75	8.95
Annual	51.56	52.66

c. Transportation Facilities. - (1) U. S. Route 20 and State Route 112 pass through the town of Huntington. (Huntington is approximately 2-1/2 miles south of the project site). U. S. Route 20 connects with the Massachusetts Turnpike (Exit 6) approximately 10 miles south of Huntington. Local and town roads provide access to project site.

(2) It will be the responsibility of the contractor to make his own investigation of transportation facilities including railroads and public roads and private lands and make his own arrangement for their use.

SC-6. RATES OF WAGES. - a. The minimum wages to be paid laborers and mechanics on this project, as determined by the Secretary of Labor to be prevailing for the corresponding classes of laborers and mechanics employed on projects of a character similar to the contract work in the pertinent locality, are as set forth below.

b. Any class of laborers and mechanics not listed below employed on this contract shall be classified or reclassified conformably to the schedule set out below by mutual agreement between the contractor and class of labor concerned, subject to the prior approval of the Contracting Officer. In the event the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers and mechanics to be used, the question, accompanied by the recommendation of the Contracting Officer, shall be referred to the Secretary of Labor for final determination.

MINIMUM RATES OF WAGES FOR THIS PROJECT AS DETERMINED BY THE SECRETARY OF LABOR WILL BE INCORPORATED INTO THE SPECIFICATIONS BY AN AMENDMENT TO BE ISSUED PRIOR TO OPENING OF BIDS.

c. Health and Welfare Funds. - The wage rates contained in this decision are straight hourly wage rates. In some areas management and labor organizations in the construction industry have collectively bargained for health and welfare fund contributions. Such contributions are not included in wage rates determined by the Secretary of Labor for construction projects.

SC-7. VARIATIONS IN ESTIMATED QUANTITIES. - a. Where the quantity of a pay item in this contract is an estimated quantity (identified on Unit Price Schedule with an asterisk) and where the actual quantity of such pay item is more than 115% or less than 87% of the estimated quantity stated in this contract, as modified, an equitable adjustment in the contract price shall be made upon demand of either party. For overruns the equitable adjustment shall be limited to the number of units by which the actual quantity exceeds 115% of the estimated quantities. Where the actual quantity of any pay item is less than 87% of the estimated quantity stated in this contract, the final payment will be computed by applying the contract unit price to 87% of the estimated quantity shown in the contract and then deducting from the result an amount obtained by applying to the number of units of underrun below the 87% of the estimated quantity a negotiated price per unit of such underrun. The unit price for the deduction shall represent the reasonable cost to the contractor of performing the units of work exclusive of the mobilization and other fixed costs relating thereto.

b. In order to permit the contractor to distribute his indirect costs properly to Items Nos. 39, 40 and 99, these items have been subdivided into sub-items. All the contractor's indirect costs for each of these items will be included in the bid prices for the mobilization and demobilization sub-items listed under the respective items. Variation from the estimated quantity in the actual work performed under any other sub-item or elimination of all work under such a sub-item will not be the basis for an adjustment in contract unit price.

c. If any item within the scope of subparagraph a. above is more than 105% or less than 96% of the estimated quantity stated in the contract, as modified, or if the quantity of any item listed in subparagraph b. above exceeds 105% or is less than 96% of total of the sub-items under that item and if such variation causes an increase or a decrease in the time required for performance of this contract the contract completion time will be adjusted as follows:

(1) If the quantity variation is such that it will cause an increase in the time necessary for completion, the Contracting Officer shall, upon receipt of a written request for an extension within 10 days from the beginning of such delay or within such further period of time which the Contracting Officer grants prior to the date of final settlement of the contract, ascertain the facts and make such adjustment for extending the completion date as in his judgment the findings justify.

(2) If the quantity variation is such that it will cause a decrease in the time necessary for completion, the Contracting Officer shall ascertain the facts and promptly notify the contractor in writing of his findings and the extent of the adjustment.

d. If the parties fail to agree upon the adjustment to be made the dispute shall be determined as provided in Clause 6, "Disputes" of the General Provisions.

SC-8. GOVERNMENT-FURNISHED PROPERTY. - The Government will furnish to the contractor the following property to be incorporated or installed in the work or used in its performance. Such property will be furnished f.o.b. railroad cars or f.o.b. truck at the project site and the contractor will be required to accept delivery when made, paying any demurrage incurred, and unloading and transporting the property to the job site at his own expense. All such property will be installed and/or incorporated into the work at the expense of the contractor, unless otherwise indicated herein. Any property so furnished which is excess upon the completion of the work shall remain the property of the Government. The contractor shall verify the quantity and condition of such Government furnished property when delivered to him, acknowledge receipt thereof in writing to the Contracting Officer, and in case of damage to or shortage of such property, he shall within 24 hours report in writing such damage and/or shortage to the Contracting Officer.

Quantity	Description
2	Bronze plaques with expansion bolts and rosettes
1	Contaiminated clothes chute
1	Membrane door
1	Antiback-draft valve

SC-9. OMITTED.

SC-10. WATER. - The responsibility shall be upon the contractor to provide and maintain at his own expense an adequate supply of water for his use for construction and domestic consumption, and to install and maintain necessary supply connections and piping for same, but only at such locations and in such manner as may be approved by the Contracting Officer. Before final acceptance, temporary connections and piping installed by the contractor shall be removed in a manner satisfactory to the Contracting Officer.

SC-11. ELECTRICITY. - All electric current required by the contractor shall be furnished at his own expense. All temporary connections for electricity shall be subject to the approval of the Contracting Officer.

All temporary lines will be furnished, installed, connected, and maintained by the contractor in a workmanlike manner satisfactory to the Contracting Officer and shall be removed by the contractor in like manner at his expense prior to final acceptance of the construction.

SC-12. OMITTED.

SC-13. LAYOUT OF WORK AND SURVEYS. - a. Layout of Work. - (1) The Government will establish all baselines, bench marks, and horizontal controls at the site of the work.

(2) From the baselines, bench marks, and controls establish by the Government, the contractor shall complete the layout of the work and shall be responsible for all measurements that may be required for the execution of the work to the location and limit marks prescribed in the specifications or on the contract drawings, subject to such modifications as the Contracting Officer may require to meet changed conditions or as a result of necessary modifications to the contract work.

(3) The contractor shall furnish, at his own expense, such stakes, templates, platforms, equipment, tools and material, and all labor as may be required in laying out any part of the work from the baselines and bench marks established by the Government. It shall be the responsibility of the contractor to maintain and preserve all stakes and other marks established by the Contracting Officer until authorized to remove them, and if such marks are destroyed, by the contractor or through his negligence prior to their authorized removal they may be replaced by the Contracting Officer, at his descretion, and the expense of replacement will be deducted from any amounts due or to become due the contractor. The Contracting Officer may require that work be suspended at any time when location and limit marks established by the contractor are not reasonably adequate to permit checking of the work.

b. Quantity Surveys. - (1) The contractor shall furnish all personnel, equipment and material required to make all original and final surveys to determine the quantities forming the basis of final payments. Such surveys will be made under the direct supervision of a Government employee who will also record the notes and supervise the computations by contractor personnel. Original copies of survey notes will become the property of the Government.

(2) The contractor shall make such surveys and computations as are necessary to determine the quantities of work performed or placed during each period for which a progress payment is to be made. All original field notes, computations, and other records taken by the contractor for the purpose of progress surveys shall be furnished promptly to the representative of the Contracting Officer and shall be used to the extent necessary in determining the proper amount of progress payments due to the contractor. Unless waived in each specific case, quantity surveys made by the contractor shall be made under the direction of a representative of the Contracting Officer.

c. Verification. - The Government may make checks as the work progresses to verify lines and grades established by the contractor and to determine the conformance of the completed work as it progresses with the requirements of contract specifications and drawings. Such checking by the Contracting Officer or his representatives shall not relieve the contractor of his responsibility to perform all work in accordance with the contract drawings and specifications and the lines and grades given therein.

SC-14. PAYMENTS FOR MOBILIZATION AND PREPARATORY WORK. - Payments will not be made under this contract for mobilization and preparatory work.

SC-15. DAMAGE TO WORK. - a. The responsibility for damage to any part of the work to be performed under this contract shall be as set forth in the article of the contract entitled "Permits and Responsibility for Work". However, if the permanent cofferdam is constructed in accordance with plans and progress schedules approved by the Contracting Officer, but is overtopped by flood or earthquake and such flood or earthquake causes damages to the permanent cofferdam and/or any part of the permanent work, which damage is not due to the failure of the contractor to take reasonable precaution or to exercise sound engineering and construction practices in the conduct of the work, the contractor will make the repairs ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. If in the opinion of the Contracting Officer, there are no contract unit or lump sum prices applicable to any part of such damaged work, an equitable adjustment pursuant to Article 3, Changes, of the contract, will be made as full compensation therefor.

b. The contractor may, subject to approval of the Contracting Officer, or the Contracting Officer may order the contractor to, flood or breach the permanent cofferdam during a rise prior to, and in anticipation of, natural flooding due to overtopping. Such flooding or breach will be considered the same as though the permanent cofferdam, if constructed in accordance with plans and progress schedules approved by the Contracting Officer, has been overtopped, in which event an equitable adjustment will be made for damages to the permanent cofferdam and/or any part of the permanent work, as provided in a. above.

c. Maintenance of Drainage. - The contractor will be required to maintain adequate drainage through drainage structures and waterways during the life of the contract. When winter weather conditions are such as to cause obstruction of normal drainage ways by accumulations of ice, snow, or a combination of both, suitable measures, such as application of salt, shall be instituted by the contractor and maintained to prevent damage to materials or new or existing work.

SC-16 to SC-23, Inclusive. OMITTED.

SC-24. FUNDS AVAILABLE FOR PAYMENTS. - a. Such work as may be done under this contract in excess of the amount for which funds are available for payment as herein set forth, will be continued with funds hereafter appropriated and alloted for this work.

b. From funds heretofore appropriated by the Flood Control Act, approved 3 July 1958, Public Law 85-500, the sum of $25,000.00 is avilable for payments to the contractor for work performed under this contract.

c. If at any time it becomes apparent to the Contracting Officer that the balance of this allocation is in excess of the amount required to meet all payments due and to become due the contractor because of work performed and to be performed pursuant to his approved progress schedule, the right is reserved after due notice to the contractor to reduce said allocation by the amount of such excess.

d. If the rate of progress of the work is such that it becomes apparent to the Contracting Officer that the balance of this allocation and any allocation for this and any subsequent fiscal years during the period of this contract is less than that required to meet all payments due and to become due the contractor because of work performed or to be performed under this contract, the Contracting Officer may provide additional funds for such payments if there be funds available for such purpose. The contractor will be notified in writing of any additional funds so made available. However, it is distinctly understood and agreed that the amount of funds stated in b. above is the maximum amount the Government insures will be available during the current fiscal year and the Government is in no case liable for payments to the contractor beyond this amount prior to having notified the contractor in writing of any additional funds that can be made available. Accordingly, no progress schedule will be approved (see Par. GC-5(a)) which contemplates progress requiring funds in excess of the amount stated to be available in b. above for the current fiscal year and no progress schedule will be approved for any ensuing fiscal year which contemplates progress requiring funds in excess of the amount allocated by the Contracting Officer from funds subsequently made available, except as set forth and subject to the conditions in subparagraph i. below.

e. It is expected that, during subsequent fiscal years over the period of this contract, Congress will make additional appropriations for expenditure on work under this contract. The Contracting Officer will notify the contractor of any additional allocation of funds to this contract when such funds become available. It is understood and agreed that the Government is in no case liable for damages in connection with this contract on account of delay in payments to the contractor due to lack of available funds. Should it become apparent to the Contracting Officer that the available funds will be exhausted before additional funds can be made available, the Contracting Officer will give at least 30 days written notice to the contractor that the work may be suspended. If the contractor so elects, after receipt of such notice, he may continue work under the conditions and restrictions under the specifications, so long as there are funds for inspection and superintendence, with the understanding, however, that no payment will be made for such work unless additional funds shall become available in sufficient amount. When funds again become available, the contractor will be notified accordingly. Should work be thus suspended, additional time for completion will be allowed equal to the period during which work is necessarily so suspended, as determined by the dates specified in the above-mentioned notices.

f. So long as funds are available, payments will be made monthly in accordance with article of the contract entitled, "Payments to Contractors." The unit prices or lump sum price or prices stated in the contract will be used in determining the amount to be paid for work performed by the contractor.

g. The procedure above described will be repeated as often as may be necessary on account of the exhaustion of available funds and the necessity of awaiting the appropriation of additional funds by Congress.

h. Should Congress fail to provide additional funds the contract may be terminated and considered to be completed, at the option of the contractor, without prejudice to him or liability to the Government, at any time subsequent to 30 days after payments are discontinued, or at any time subsequent to 30 days after passage of the Act which would have but did not carry an appropriation for continuing the work or after the adjournment of the Congress which failed to make the necessary appropriations. However, if the funds cited in the contract are enough to extend the work beyond the end of the fiscal year and no new funds are allocated to the contract for the ensuing fiscal year, the contractor must first exhaust all the cited funds and thereafter he may, at his option, exercise the rights provided in this paragraph any time after payments are discontinued.

i. The progress chart prepared in accordance with GC-5(a) will be consistent with the amount of funds stated in subparagraph b. above, as being currently available for the period of time from the date of contract award to the end of the fiscal year in which the contract was awarded, or at the option of the contractor, the chart may be prepared on the basis of accomplishment of work at a greater rate of progress for the period of time applicable to currently available funds. Any chart initially submitted for approval which contemplates progress at a greater rate than can be paid for with currently available funds will be approved only under the condition that such approval will in no way obligate the Government to make additional funds available for the work. That part of the chart which covers the work for which funds are not currently available will be prepared on the basis of a schedule considered to be practicable by the contractor for accomplishment of the work at such rate of progress as he may desire for completion within the terms of the contract. The progress chart will be revised each time the contractor is notified that additional funds are made available. Each revision will conform with the criteria stated above. With reference to the responsibilities for future funding of the work in accordance with the progress chart, attention is called to the preceding subparagraphs wherein the responsibilities of the Government are set forth for the furnishing of funds for the work. The approval of that part of the schedule covering work for which funds are not currently available will in no way obligate the Government to provide funds to accomplish work at the rate of progress indicated in the schedule.

SC-25. OMITTED

SC-26. OMITTED

SC-27. ADDITIONAL SUPERVISION OF SUBCONTRACTED WORK. - The contractor shall be required to furnish the following in addition to the superintendence required by the General Provisions entitled "Superintendence by Contractor":

a. If less than 70 percent and more than 50 percent of the value of the contract work is subcontracted one superintendent shall be provided at the site and on the contractor's payroll to be responsible for coordinating, directing, and expediting the subcontracted work.

b. If 70 percent or more of the value of the work is subcontracted the contractor shall be required to furnish two superintendents to be responsible for coordinating, directing and expediting the subcontract work. If the Contracting Officer at any time after 50 percent of the subcontracted work has been completed finds that satisfactory progress is being made, he may waive all or part of the above requirement for additional superintendence subject to the right of the Contracting Officer to reinstate such requirement if at any time during the progress of the work he finds that satisfactory progress is not being made.

SC-28. SCHEDULING AND DETERMINATION OF PROGRESS. - a. Independent of partial payments made pursuant to General Provision 7, Payments, (Standard Form 23A), progress schedules prepared under the requirements of GC-5, Progress Charts and Requirements for Overtime Work, shall provide as scheduled progress for only 25 percent of the estimated invoiced cost of materials or equipment delivered to the site but not incorporated in the work as of the time of the scheduled delivery thereof.

b. In determining progress accomplished the Contracting Officer will allow as an element of work accomplished (progress toward completion) only 25 percent of the invoiced cost of materials or equipment delivered to the site but not incorporated in the construction up to the time the materials or equipment are actually incorporated in the work.

SC-29. TIME EXTENSIONS. - Notwithstanding any other provisions of this contract it is mutually understood that the Government has the right to determine the extent, if any, by which a change in plans or specifications or excusable delays will cause delay in the completion of various elements of construction. The Contracting Officer may unilaterally provide in a change order that a contract completion date will be extended only for those specific elements so delayed and that the remaining contract completion date for all other portions of the work would not be altered and further provide for an equitable readjustment of liquidated damages, if any, pursuant to the new completion schedule.

SC-30. REVERSE SIGNAL ALARMS. - All self-propelled construction equipment, except light service trucks, panels, pickups, station wagons, crawler-type cranes, power shovels and draglines; whether moving alone or in combination shall be equipped with a reverse signal alarm. The alarm shall be mounted on the rear of the equipment and shall be so protected or constructed as to withstand severe wear and tear, adverse weather and unfavorable environmental working conditions and shall be certified by the manufacturer as fully meeting the following performance standards.

The alarm shall produce a relatively pure tone which shall peak within the American Standards Association standard octave passband of 600 to 2400 cycles per second and shall produce a 0.2 to 0.5 second audible warning within the initial three (3) feet of backward movement of the vehicle on which it is mounted and at regular intervals, not to exceed three (3) seconds throughout the backward movement. The alarm shall automatically cut out when backward movement ceases. The sound intensity of the alarm shall range from and not exceed 90-100 db (decibals) at a horizontal distance of 5 feet from the alarm.

Actuation of the alarm shall be automatic by direct connection to any part of the equipment that moves or acts in a manner distinctive only to the rearward movement of the vehicle with no manual controls of any kind between the source of actuation and the alarm. Where application of this requirement to specific types of equipment has impractical application other means of actuation may be used upon written approval of the Contracting Officer.

The use of the alarm shall be in addition to prescribed requirements for signalmen.

SC-31. OMITTED

SC-32. SAFETY NETS. - Safety nets shall be provided and installed for the protection of persons and property on the following operations:

a. Construction of access and service bridges.

The nets shall be in good condition, with not less than 3/8-inch diameter manila mesh ropes arranged at not more than 6 inch centers, positively attached to avoid wear at each point of crossing and at points of contact with 3/4-inch diameter border ropes. Net attachment and suspension system shall be in accordance with the net manufacturer's recommendations. No operation which requires safety net protection shall be undertaken until the safety net is properly installed.

The safety nets shall be faced with a 1-inch mesh wire meshing when men are required to work below nets, when nets are over streets or other traffic ways, or when required to protect installed equipment or finished work.

SC-33. PERFORMANCE OF WORK BY CONTRACTOR. - The contractor shall perform on the site and with his own organization, work equivalent to at least twenty percent (20%) of the total amount of the work to be performed under the contract. If during the progress of the work hereunder, the contractor requests a reduction in such percentage, and the Contracting Officer determines that it would be to the Government's advantage, the percentage of the work required to be performed by the contractor may be reduced; provided, written approval of such reduction is obtained by the contractor from the Contracting Officer.

SC-34. CONTRACT BID BREAKDOWN. - The contractor shall furnish within 10 days after date of award of contract a breakdown of each lump sum bid. Partial payments will be based on this breakdown. The contractor's breakdown will be reviewed by the Contracting Officer to insure that costs are proportioned properly between early and late pay items. Any unbalanced items or other discrepancies will be revised by the Contracting Officer and the approved breakdown will be utilized as a basis for progress payments to the contractor.

SC-35. TEMPORARY HEAT. - All temporary heat required by the contractor in connection with his construction operations shall be furnished or provided by or at the expense of the contractor. No source of any Government type of heating system will be available for the use of the contractor. Heaters shall be listed by the Underwriters' Laboratories, Inc., and be installed and maintained in accordance with the manufacturers' instructions. The use of "salamanders" shall not be permitted. If the contractor is permitted to use the heating system of any structure for temporary heat, all fuel oil remaining in the tank upon completion of the work shall become the property of the Government at no additional cost.

SC-36. OMITTED

SC-37. SOILS AND MATERIALS CONTROL. - a. The contractor shall furnish two vehicles, preferably pick-up trucks, the maintenance and operation of which will be the contractor's responsibility, and shall provide four employees, approved and qualified as stated below, to aid the Contracting Officer in the sampling and testing of soils, portland cement concrete, bituminous concrete, and similar materials. Employee qualifications shall include a high school education or the equivalent thereof. The work to be done by these employees shall include, but shall not be limited to, assisting in the performance of field and laboratory tests. Each employee shall be adaptable to the anticipated work and his final acceptance by the Contracting Officer will not be made until he has undergone a two-week training period at the New England Division Laboratories in Waltham, Mass. The personnel and equipment shall be made available within 30 days after receipt of notice to proceed and shall be assigned full-time and continuously to the Contracting Officer until no further sampling and testing is required. The personnel and equipment shall be under the direction and supervision of the Contracting Officer and shall be such as to permit sampling and testing to be maintained and concurrent with the progress of construction to insure that sampling and testing will be performed continuously. Sampling and testing will include that necessary to determine that all construction conforms to contract requirements and such other sampling for the project as directed. No separate payment will be made for the services of the above equipment and personnel, the costs of which will be considered as a subsidiary obligation of the contractor.

SC-38. CONSTRUCTION SIGN. - The contractor shall furnish and erect a construction sign conforming to the requirements of Drawing No. CT-1-5818, Sheet 1, 12 ft. x 6 ft., attached at the end of the SPECIAL CONDITIONS. The sign shall be erected at a location selected by the Contracting Officer not later than 30 calendar days after notice to proceed. Upon completion of the work, the sign will remain the property of the contractor. No separate payment will be made for furnishing and erecting the sign.

SC-39. SAFETY SIGN. - The contractor shall construct a safety sign at a location directed by the Contracting Officer. The sign shall be 3 feet by 6 feet in size and shall conform to the requirements of Drawing No. 40-05-06, Sheet 1 of 1 attached hereto. The sign shall be erected as soon as possible and within 30 calendar days after date of notice to proceed. The date required by the sign shall be corrected as necessary. No separate payment will be made for erecting and maintaining the safety sign and all costs in connection therewith will be considered a subsidiary obligation of the contractor. The sign will remain the property of the contractor. A previously built sign may be reused when satisfactorily reconditioned.

SC-40. ACCIDENT PREVENTION. - a. Contractor's Proposals. - The contractor's proposals for effectuating the requirements of Paragraph GC-16, "Accident Prevention" shall be submitted in quintuplicate to the Resident Engineer as the Contracting Officer's representative.

b. Transportation of Explosives. - Transportation of explosives and other dangerous articles by the contractor shall be in accordance with Subparagraph e. below, appropriate regulations, local laws or ordinances, and the Corps of Engineers Manual "General Safety Requirements".

c. Outlining Loaded Hole Areas. - The contractor shall be required to clearly outline any loaded hole area, or areas. This may be accomplished by roping off the entire loaded hole area, or by markers of sufficient height, color, and spaced so that the entire loaded hole area will be clearly and definitely outlined. The exact method of outlining such areas shall have the prior approval of the Contracting Officer.

d. Protective Headgear. - All employees of the contractor and other persons shall wear protective headgear (hard hats) at all times while in the work area(s).These work area(s) shall be all area(s) within the contract work limits.

e. General Requirements. - All applicable requirements of the safe practices on construction work as covered in the "Manual of Accident Prevention in Construction" as published by the Associated General Contractors of America, Inc., shall apply to the work under this contract. Particular attention is invited to the manual's requirements covering tunnels and shafts. The requirements listed in the manual are minimum requirements and do not decrease or eliminate any other accident prevention features covered in other parts of these specifications.

f. Use of Swing Scaffolds. - In addition to the requirements of the Corps of Engineers Manual "General Safety Requirements", the following shall be required when swing scaffolds are used:

(1) A safety line, hung independent of the scaffold and its support, and which reaches the ground, shall be provided for each workman on a swinging scaffold.

(2) Each workman shall wear a safety belt attached to the safety line by an approved method so as to prevent a free fall of more than five feet.

SC-41. SPARE PARTS DATA. - The contractor shall provide spare parts data for all items of equipment having moving parts or otherwise subject to wear, furnished and installed by him. The data shall be in the form of an equipment manufacturer's spare parts catalog and an operation and maintenance manual. Accompanying the spare parts catalog shall be a list indicating the quantity of each spare part which the equipment manufacturer recommends as required to insure efficient operating capability for a period of 120 days. The list shall also indicate the unit price of each spare part and the source of procurement. The required data shall be submitted as a complete package for each item of work for which a completion date is established and as soon after award of contract as practicable, but in any case not later than one hundred twenty (120) days prior to completion of the applicable item of work and shall be completely marked as to contents, job and contract number.

SC-42. GUARANTEE. - Where the Technical Provisions require that certain equipment is to be guaranteed, the guarantee shall be for a period of one year from the date of acceptance thereof, either for beneficial use or final acceptance, whichever is earlier, against defective materials, design and workmanship. Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guaranteed period, the affected part or parts shall be replaced promptly with new parts by and at the expense of the contractor. Installation of new parts shall also be by and at the expense of the contractor.

SC-43. OPERATOR'S QUARTERS. - Funds for the construction of the Operator's Quarters, including the Garage, are limited due to Congressional limitations. In the event the work for these structures are deleted from the work (See Note 3 in Unit Price Schedule), the contractor shall cap all underground pipes 5-feet outside building walls, grade the areas to blend into indicated adjacent grade, including topsoiling and seeding. All work outside the building lines included under Items 97 and 98, such as concrete walks, shall also be deleted. The contractor however, shall perform all other work in area (except Item 101). Payment for additional topsoiling and seeding will be made at the applicable contract price.

SC-44. IDENTIFICATION OF MECHANIZED EQUIPMENT. - All contractor's machinery, motor vehicles and mechanized equipment as may be required by the Contracting Officer, shall have posted in a conspicuous location on each piece of equipment, acceptable identification showing the owner's name and an identifying number.

SC-45. OMITTED

SC-46. PROJECT BULLETIN BOARD. - The contractor shall furnish, install and maintain during the life of the project a weathertight bulletin board approximately 3 feet high by 5 feet wide having not less than 2 hinged or sliding glazed doors with provisions for locking. The bulletin board shall be mounted, where and as approved by the Contracting Officer, in a prominent place accessible to all employees. The bulletin board shall remain the property of the contractor and shall be removed by him upon completion of the contract work. The following information, which will be furnished by the Government to the contractor, shall be posted on the bulletin board and shall be maintained by the contractor in easily readable condition at all times for the duration of the contract.

a. The Equal Economic Opportunity poster as required by General Provisions (Standard Form 23A) Clause 19, Non-discrimination in Employment.

b. The schedule of minimum wage rates for the contract as required by General Provisions (Standard Form 23A) Clause 20, Davis-Bacon Act with the minimum wage rate poster form (SOL-155).

SC-47. CERTIFICATES. - Whenever specifically required by the specifications that a certified statement be furnished to indicate compliance with a contract requirement, and in those instances where a certificate is deemed necessary by the Contracting Officer as evidence of compliance with specific contract requirements, the following will be applicable in preparing the certificates:

a. The name of the contractor, contract number, project identification and location shall be indicated.

b. Specific reference shall be made to the section of the specifications under which certification of material is furnished.

c. There must be set forth a general description of the material furnished including a statement as to how and where the material is to be used under this contract.

d. Certificates made by testing laboratories concerning composition of materials shall, in addition to the above information, indicate that the certification applies specifically to batches or lots of material shipped. These batches or lots, etc., must be designated by number or other means of identification specifying quantity and date of shipment, etc.

e. Certificates must be signed by an authorized representative of the manufacturer and must indicate the title of the signator. If signed by other than an officer of the firm, evidence of authorization by the firm must be furnished the Contracting Officer.

f. Certificates shall be furnished in triplicate.

g. All certificates must be notarized.

SC-48. OMITTED

SC-49. OMITTED

SC-50. DEVIATIONS FROM CONTRACT REQUIREMENTS. - Deviations from contract requirements will not be permitted, except under unusual circumstances. Submissions of shop drawings and materials will be assumed to be in conformance with plans and specifications, unless they contain an expressed declaration of a deviation, the reasons for it, and request for waiver.

SC-51. CONTRACTOR'S OPTIONS. - The Technical Provisions by specific references permit the contractor to select optional materials, items, systems, or equipment. The use of options is subject to the following conditions:

a. Once an option has been selected and approved, it shall be used for the entire contract.

b. The contractor will be required to coordinate his selections with the plans and specifications and to make all necessary adjustments without additional cost to the Government.

SC-52. CONCRETE AGGREGATE - APPROVED SOURCES. - Concrete aggregate meeting the requirements of these specifications can be produced from the approved sources listed below:

Type	Source
Fine and Coarse (River Deposit Only)	Donovan Bros., Inc. Huntington, Mass.
Fine and Coarse	Bill Willard, Inc. Northhampton, Mass.
Coarse	John S. Lane & Sons, Inc. Westfield, Mass.

Concrete aggregates may be furnished from any of the above listed sources, or at the option of the contractor may be furnished from any other source or sources proposed by the contractor and approved by the Contracting Officer. The contractor shall designate in writing the source or sources from which he will furnish the aggregate. If the fine aggregate and coarse aggregate are not to be furnished from the same source, the contractor shall supply coarse aggregate from one source only and fine aggregate from one source only. If the contractor proposes to furnish aggregate from a source or from sources not already approved, he may designate only one source for both coarse and fine aggregate or one source for each. Samples for testing shall be provided as required by Section 14 of the Technical Provisions. If a source proposed by the contractor is not approved for use as determined by the Contracting Officer, the contractor shall furnish aggregate from an approved source listed above at no additional cost to the Government. Approval of a source of concrete aggregate is not to be construed as approval of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata, or channels when such materials are unsuitable for concrete aggregate as determined by the Contracting Officer. Materials produced from an approved source shall meet all of the grading, uniformity, and particle shape requirements of Section 14 of the Technical Provisions of these specifications.

SC-53. FACTORS AFFECTING THE PROSECUTION OF THE WORK. - a. Goss Hill Road. - (1) The contractor will be required to permit travel by others over Goss Hill Road during the relocation and improvement operations. All required barricades, lights, signs, etc. as required for safe passage shall be provided.

(2) The contractor shall not interfere with traffic over the existing road where relocation is required until the new section of road is completed. No borrow operations will be permitted in this area that would interfere with road travel.

b. Responsibility. - Section 2 covers the construction of auxiliary and temporary cofferdams relative to the construction of certain phases of the work. The contractor's attention is directed to the fact that any damage to the new work due to flooding or by failure of the contractor to properly construct the temporary and auxiliary cofferdams shall be repaired by and at the expense of the contractor as outlined in Section 2.

SC-54. WARNING SIGNS. - The contractor shall construct, erect, and maintain four warning signs at various locations, where directed, along the perimeter of the contractor's work areas. These signs will generally be located where existing roads enter the work areas. The signs shall be 4 feet by 2 feet in size and shall be securely mounted on wood posts provided and installed by the contractor. The signs may be made of 1/2-inch plywood, 3/4-inch dressed stock, not less than 8 inches in width held together with 3/4-inch by 2-inch battens on the rear, or from galvanized sheet metal (16 gage) properly reinforced. After assembly, all surfaces of the sign shall be given not less than two coats of a white exterior type finish paint. If wood is used, the wood shall be primed prior to finish painting. Lettering shall be of proper size for the intended use and shall be done by a sign painter, using quick-drying paint. The following words shall appear on the sign:

DANGER
BLASTING OPERATIONS
TURN OFF ALL 2-WAY RADIOS

Wood signs shall be fastened to wood posts with not less than three 2-inch galvanized wood screws. Metal signs shall be installed in similar manner. The warning signs shall be erected as soon as possible and within 30 calendar days after date of receipt of notice to proceed. No separate payment will be made for erecting all signs and maintaining and removal of the warning signs when the entire work is completed, and all costs in connection therewith will be considered a subsidiary obligation of the contractor.

SC-55. PLANT. - The contractor agrees to keep on the job sufficient plant to meet the requirements of the work. The plant shall be in satisfactory operating condition and capable of safely and efficiently performing the work as set forth in the specifications and the plant shall be subject to inspection by the Contracting Officer at all times. The following plant is the minimum which the contractor agrees to place on the job unless otherwise determined by the Contracting Officer; its listing herein is not to be construed as an agreement on the part of the Government that it is adequate for the performance of the work.

Minimum Plant to be Used on the Work
(To be Filled in before Contract is Signed)

No.	Type	Capacity	Condition

The measure of the "capacity of the Plant" shall be its actual performance on the work to which these specifications apply.

SC-56. BLASTING. - a. All operations involving the transportation, storage and use of explosives shall be conducted in accordance with applicable laws and the Corps of Engineers' "General Safety Requirements Manual" a copy of which is available for inspection in the office of the Division Engineer and the "Manual of Accident Prevention in Construction".

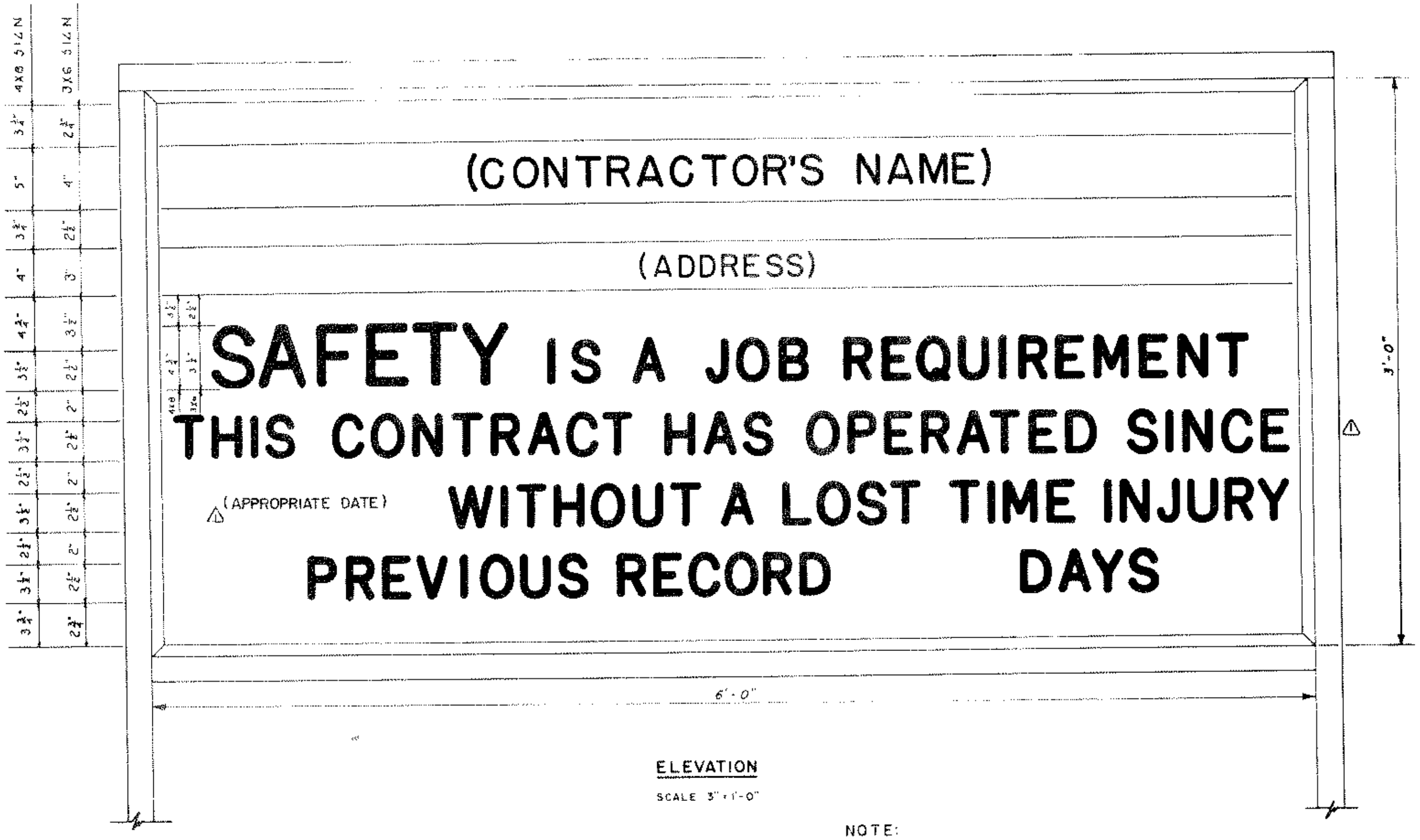
b. All vehicles assigned to the daily transportation of explosives and other dangerous articles will be inspected not less frequently than once a week. Vehicles which are occasionally used for this purpose shall be inspected within one week prior to such use.

c. Inspection shall be performed by competent assigned contractor's personnel other than the operator of the vehicle inspected. Inspection forms will be approved by the Contracting Officer and a completed copy of each inspection will be furnished the Contracting Officer.

d. Blasting will be permitted only when proper precautions are taken for the protection of all persons, work, and property, and any damage done to the work or property shall be repaired promptly by the contractor at his expense. The contractor or his surety shall, prior to commencement of blasting operations, make all necessary investigations including inspection of structures near the area of blasting and will, during blasting, control vibration as necessary to assure protection of these structures in conformance with regulatory statutes or directives established by State or other authorities to limit the amount of vibration generated by blasting.

CORPS OF ENGINEERS

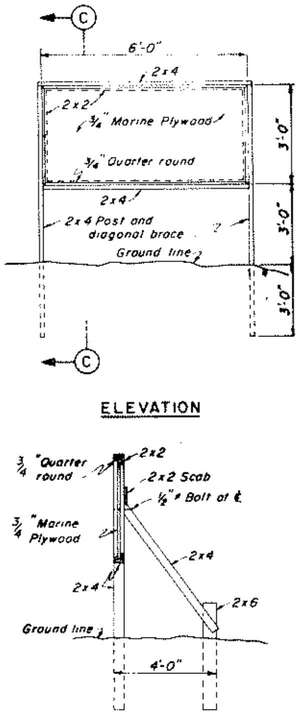
U. S. ARMY



ELEVATION

SCALE 3" = 1'-0"

NOTE:
This elevation is of a 3' x 6' Sign.
See specifications for size required
under this contract.



ELEVATION

SECTION C-C

3' x 6' SIGN

(4' x 8' SIGN SIMILAR)

⚠ **SPECIFICATIONS**

1. Posts, rails and bracing shall be No. 1 yellow pine or approved equal S4S-Fed. Spec. MM-L-751c.

2. All exposed surfaces, including edges, shall be given one coat of linseed oil and wiped prior to primer coat, one coat of exterior lead and oil primer conforming to Fed. Spec. TT-P-25a, and two finish coats of white exterior paint conforming to Fed. Spec. TT-P-104.

3. Black lettering paint shall be Kem Bulletin Color C20 Bl as manufactured by Sherwin-Williams Co., or approved equal.

4. Plywood shall conform to Commercial Standard CS-45, exterior type, Grade A-C.

REVISION	DATE	DESCRIPTION	BY
⚠	4-11-57	Sign information and specifications revised.	

CORPS OF ENGINEERS U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION
BOSTON MASS

DES BY	DR BY	CK BY
CH	K.B.	

CHIEF DESIGN BRANCH

PROJECT ENGINEER

SUBMITTED BY:

CHIEF MILITARY BRANCH

APPROVED:

CHIEF ENGINEERING DIV

APPROVED

COL. C.E. FOR THE DIVISION ENGINEER

SAFETY SIGN

DATE JULY 1955

SCALE AS SHOWN

SPEC NO

DRAWING NUMBER
40-05-06

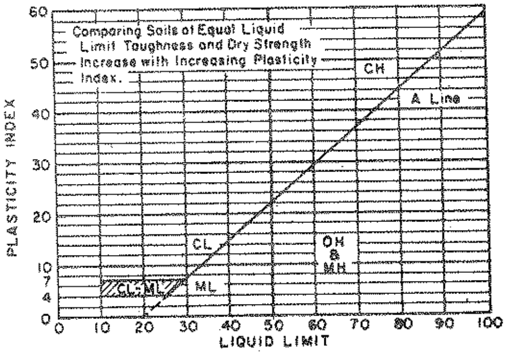
SHEET 1 OF 1

⚠

UNIFIED SOIL CLASSIFICATION
(Including Identification and Description)

Major Divisions			Group Symbols	Typical Names	Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weight).	Laboratory Classification Criteria		
Coarse-grained Soils More than half of material is larger than No. 200 sieve size The No. 200 sieve size is about the smallest particle visible to the naked eye.	Gravels More than half of coarse fraction is larger than No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size)	Clean Gravels (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.	Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows: Less than 5% GW, GP, SW, SP, More than 12% GM, GC, SM, SC, 5% to 12% Borderline cases requiring use of dual symbols.	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			GP	Poorly graded gravels, or gravel-sand mixtures, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.		Not meeting all gradation requirements for GW	
		Gravels with Fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixture.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).		Atterberg limits below "A" line with PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
			GC	Clayey gravels, gravel-sand-clay mixture.	Plastic fines (for identification procedures see CL below).		Atterberg limits above "A" line with PI greater than 7	
	Sands More than half of coarse fraction is smaller than No. 4 sieve size.	Clean Sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.		$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			SP	Poorly graded sands or gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.		Not meeting all gradation requirements for SW	
		Sands with Fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).		Atterberg limits above "A" line or PI less than 4	Limits plotting in hatched zone with PI between 4 and 7 are borderline cases requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below).		Atterberg limits above "A" line with PI greater than 7	

Major Divisions		Group Symbols	Typical Names	Identification Procedures on Fraction Smaller than No. 40 Sieve Size		
				Dry Strength (Crushing characteristics)	Dilatancy (Reaction to shaking)	Toughness (Consistency near PL)
Fine-grained Soils More than half of material is smaller than No. 200 sieve size The No. 200 sieve size is about the smallest particle visible to the naked eye.	Silts and Clays Liquid limit is less than 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight	Quick to slow	None
		CL	Inorganic clays of low to medium plasticity gravelly clays, sandy clays, silty clays, lean clays.	Medium to high	None to very slow	Medium
		OL	Organic silts and organic silty clays of low plasticity.	Slight to medium	Slow	Slight
	Silts and Clays Liquid limit is greater than 50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium	Slow to none	Slight to medium
		CH	Inorganic clays of high plasticity, fat clays.	High to very high	None	High
		OH	Organic clays of medium to high plasticity, organic silts.	Medium to high	None to very slow	Slight to Medium
Highly Organic Soils		PT	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture.		



PLASTICITY CHART
For laboratory classification of fine-grained soils

(1) Boundry classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well-graded gravel-sand mixture with clay binder.
(2) All sieve sizes on this chart are U. S. standard.

NOTE

For further information on Unified Soil Classification, refer to "The Unified Soil Classification System," Volumes 1 and 2, Technical Memorandum No. 3-357, published by U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. File copies may be examined at Headquarters, U. S. Army Engineer Division, New England, 424 Trapelo Road, Waltham, Massachusetts., Building 141, Foundation and Materials Branch.

Adopted by Corps of Engineers and Bureau of Reclamation, January 1952

NEDGL 61-5C

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm	PL	LL		TOTAL	-NO4	STND. AASHO OPT. WATER % DRY WT	STND. AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
FD-1	553.2	J-3	5.0- 8.9	SM	39	45	16															
		J-5	10.0-10.8	SM	1	58	41	0.015														
		J-7	15.0-20.0	SM	20	55	25	0.024														
		J-9	25.0-26.0	ML	1	40	59	0.017														
		J-12	30.0-32.7	SP-SM	3	86	11	0.072														
		J-13	32.7-35.0	SM	13	50	37	0.02														
		J-15	37.0-38.7	SM	3	49	48	0.011														
FD-2	503.5	J-2	2.2- 5.0	SM	20	48	32	0.018														
		J-4	10.0-11.6	SM	34	37	29	0.014														
FD-3	534.0	J-1	0.5- 5.0	SM	18	43	39	0.015														
		J-3	8.0- 9.5	SM	11	48	41	0.014														
FD-4	536.0	J-2	3.0- 5.0	SM	22	40	38	0.031														
		J-4	7.0- 8.6	SM	2	56	42	0.026														
FD-5	439.6	J-2	1.0- 5.0	SP-SM	0	88	12	0.07														
		J-7	30.0-33.1	SM	22	42	36	0.007														
		J-9	40.0-42.2	SM	21	42	37	0.0085														
FD-6	501.3	J-3	5.0-10.0	SM	32	52	16	0.043														
		J-5	15.0-19.0	GM	46	40	14	-														
		J-8	25.0-30.0	ML	6	38	56	0.015														
		J-11	35.0-40.0	ML	4	43	53	0.0038														
		J-14	50.0-54.7	ML	7	41	52	0.0026														
		J-17	70.0-72.8	SM	5	48	47	0.0052														
		J-19	85.0-89.8	SM	9	59	32	0.0098														

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	PL	LL		TOTAL	- NO4	STND. AASHO OPT. WATER % DRY WT	STND. AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	- NO4	SHEAR	CONSOL.	PERM.	
FD-7	517.0	J-5	13.0-15.0	SM	29	32	39	0.011														
		J-6	15.0-20.0	ML	5	28	67	0.0049														
		J-9	30.0-34.2	SM	21	43	36	0.007														
FD-8	533.3	J-2	2.2- 3.3	SM	9	55	36	0.018														
		J-9	13.9-18.9	SM	14	66	20	0.05				11.8	13.8									
		J-12	21.8-23.9	SM	30	42	28	0.024				9.6	13.8									
		J-15	25.0-27.4	SM	15	56	29	0.021				6.6	7.7									
		J-18	30.2-33.0	SM	3	65	32	0.024				14.1	14.6									
		J-24	43.1-43.5	SM	1	59	40	0.019				12.7	—									
FD-9	557.0	J-3	5.0-10.0	SM	15	48	37	0.02				6.2	7.3									
		J-5	10.0-12.7	GM								10.2	18.2									
		J-5	10.0-12.7	GM	44	38	18	0.053														
		J-8	17.9-20.2	SM	8	62	30	0.03				15.4	16.7									
FD-10	575.0	B-5	3.6- 5.0	SM	12	49	39	0.01														
		B-8	5.0-10.0	SM	22	44	34	0.013														
		J-10	13.5-14.5	SM								14.6	16.2									
		B-11	10.0-15.0	SM	17	58	25	0.024														
		J-12	15.0-15.7	SM	35	42	23	0.034				21.3	22.9									
		J-7	7.0- 7.7	SM								12.1	15.0									
FD-12	440.4	B-6	7.0-10.0	GP	80	18	2	0.51														
		B-8	10.0-15.0	GP	59	37	4	0.14														
		J-11R	15.0-20.0	GP							2.86	18.1	21.7									
		B-12	20.0-25.0	GP	71	26	3	0.4														
		B-16	30.0-35.0	SM	38	50	12	<0.074														
		J-17R	30.0-35.0	SM								13.6	22.2									
		B-18	35.0-40.0	GP-GM	54	38	8	0.1														
		J-20R	40.0-45.0	ML	5	16	79	0.0025	26	29												

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND.AASHO		COMPACTION DATA	NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D10 mm.	PL	LL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.
FD-13	442.8	B-9	7.0-10.0	SP-SM	34	57	9	0.091													
		J-10R	7.0-10.0	SP-SM								17.5	21.5								
		B-11	10.0-15.0	SM	3	81	16														
		J-12R	10.0-15.0	SM							2.74	[illegible]	26.7								
		B-13	15.0-20.0	SM	0	61	39	0.025													
		B-17	25.0-30.0	GM	47	41	12														
		B-22	34.0-39.0	GP-GM	47	43	10	0.074													
		J-25R	39.0-41.0	SM								9.2	12.6								
		B-27	42.0-46.0	GP-GM	55	36	9	0.091													
		J-28R	42.0-46.0	GP-GM								6.7	16.9								
FD-14	546.9	B-6	5.0-10.0	SM	22	53	25														
FD-15	453.3	B-4	1.2- 5.0	SM	41	46	13														
FD-16	440.6	B-3	5.0- 8.0	GP-GM	69	26	5	0.17													
		B-8	10.0-15.0	SM	32	55	13														
		B-16	30.0-35.0	GM	46	36	18														
		B-22	45.0-50.0	GP-GM	59	34	7	0.13													
FD-17	470.0	B-8	12.0-16.0	GP-GM	56	33	11	0.07													
		B-13	22.0-27.0	SM	40	42	18	0.034													
		J-17R	32.0-33.5	CL	6	27	67	0.001	24	38											
		B-23	42.0-45.0	SM	30	48	22	0.026													
		B-28	49.0-51.7	SP-SM	42	47	11	0.068													
		B-38	62.5-63.5	SM	42	45	13	0.05													
FD-19	457.7	B-4	1.6- 5.0	GM	44	43	13														
		B-8	8.7-11.6	SM	21	65	14														

*** PROVIDENCE VIBRATED DENSITY TEST.**

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	PL	LL		TOTAL	- NO4	STND. AASHO OPT. WATER % DRY WT	STND. AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	- NO4	SHEAR	CONSOL.	PERM.	
FD-20	435.1	B-6	6.1-10.0	SM	24	61	15															
		B-8	10.0-15.0	SM	40	46	14	0.05														
		B-14	23.5-25.0	GP-GM	66	26	8	0.12														
		B-17	30.0-35.0	GP-GM	69	25	6	0.16														
		B-20	40.0-45.0	GP-GM	55	40	5	0.16														
FD-24	469.4	B-6	11.0-15.0	SP-SM	32	60	8	0.09														
		B-10	20.0-25.0	GM	43	38	19	0.035														
		J-13R	25.0-30.0	SM								14.7	15.0									
		J-14R	30.0-35.0	SM	15	41	44	0.0028														
		J-15R	30.0-35.0	SM								11.3	12.4									
		J-20R	40.0-45.0	SM								11.0	12.3									
		J-22R	45.0-50.0	SM								10.1	12.4									
		B-23	50.0-55.0	GM	36	33	31	0.008														
		J-28R	60.0-65.0	SM								10.6	11.5									
FD-25	533.4	B-5	5.0- 7.3	SM	19	63	18	0.044														
FD-26	553.8	B-8	10.0-15.0	SM	28	52	20	0.035														
FD-27	505.6	B-5	5.0- 8.8	SM	19	48	33	0.017														
FD-28	479.9	B-5	5.0- 9.0	SM	29	49	22	0.032														
FD-29	499.9	B-4	4.1- 7.0	SM	38	47	15															
FD-30	502.7	B-3	3.0- 5.0	SM	23	65	12															
		B-11	14.0-19.0	SM	35	39	26	0.024														
		B-29	52.0-53.3	SM	19	38	43	0.003														
		B-45	76.2-77.0	SM	15	60	25	0.017														

* PROVIDENCE VIBRATED DENSITY TEST.

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
														STND AASHO		*					
					GRAVEL %	SAND %	FINES %	D_{10} mm	PL	LL		TOTAL	- NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	PVD LBS/CU FT	TOTAL	- NO4	SHEAR	CONSOL	PERM.
FD-31	504.4	B-3	5.0-10.0	GP-GM	50	44	6	0.14													
		B-14	30.0-35.0	SM	24	31	45	0.0022													
		B-27	52.0-54.0	SM-SC	11	43	46	0.0025	17	23											
		B-35	70.0-73.0	SM-SC	22	40	38														
		B-46	96.0-97.0	GP-GM	71	23	6	0.14													
		J-47R	96.0-97.0	SM	10	46	44	0.015													
FD-35	557.8	B-4	2.4- 5.0	SM	22	58	20	0.033													
FD-36	443.3	B-5	5.4- 7.7	GP-GM	56	37	7	0.13													
FD-37	442.4	B-7	5.0- 7.4	GP-GM	48	46	6	0.13													
FD-39	481.1	B-5	5.0- 8.3	SP-SM	39	49	12	0.07													
		B-9	10.0-13.5	SM	12	48	40	0.019													
FD-42	555.0	B-5	5.0-10.0	SM	32	47	21	0.029													
FD-44	529.9	B-1	1.8- 4.4	SM	29	50	21	0.041													
		B-6	8.0-12.0	SM	38	47	15	0.05													
		B-13	19.0-23.0	SM-SC	24	28	48	0.0034													
		J-14R	19.0-23.0	SM					19	24											
		B-16	25.0-28.4	SM	30	35	35	0.006													
FD-46	588.9	B-5	2.1- 5.0	SM	22	50	28	0.025													
		B-11	10.0-15.0	SM	40	42	18	0.041													
		B-13	15.0-19.0	ML	9	41	50	0.009w/1" Silt Strata													
		B-15	20.0-24.3	SM	25	55	20	0.033													
		B-17	25.0-28.0	GP-GM	56	35	9	0.082													
		B-23	35.0-39.2	SM	37	42	21	0.041													

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST SUMMARY DATA

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT.		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D10 mm	PL	LL		TOTAL	NO 4	STND AASHO OPT. WATER % DRY WT	STND AASHO MAX DRY DENS LBS/CU FT	* PVD LBS/CU FT	TOTAL	NO 4	SHEAR	CONSOL	PERM
FD-47	560.3	J-4	2.6- 3.2	GP-GM	46	43	11	0.073													
		J-9	10.7-12.1	SM	20	61	19	0.04													
		J-17	28.0-29.6	SM	20	48	32	0.026													
		J-24	41.6-42.3	ML	5	40	55	0.023													
FD-48	559.2	B-7	5.6-10.0	SM	19	52	29	0.025													
FD-49	593.0	B-3	2.3- 4.4	SM	17	55	28	0.023													
		B-9	11.3-15.0	SM	27	54	19	0.041													
		J-14	17.6-19.1	SM	0	52	48	0.02													
FD-50	564.8	B-4	5.0-10.0	GP-GM	59	31	10	0.074													
		B-8	15.0-18.0	SM	14	51	35	0.019													
		B-12	25.0-28.0	SM	27	40	33	0.017													
		B-19	49.0-52.0	SM	9	41	50	0.013													
FD-51	546.6	B-3	2.6- 5.0	SM	6	54	40	0.014													
		B-9	11.0-15.0	SM	20	65	15	0.043													
		B-14	20.0-25.0	SM	26	60	14	0.059													
		B-19	30.0-31.0	SM	9	58	33	0.014													
FD-52	553.7	B-8	6.4-10.0	GM	39	38	23	0.028													
		J-19	25.0-26.1	SM	14	63	23	0.037													
		J-23	30.0-31.7	SM	1	70	29	0.03													
		B-27	35.0-37.0	SP-SM	0	89	11	0.07													
		B-32	43.0-45.0	SM	18	48	34	0.033													
		B-41	55.0-56.3	SM	33	48	19	0.041													
FD-53	546.7	B-3	2.5- 5.0	SM	4	47	49	0.0088													
		B-9	7.6- 8.8	SM	18	47	35	0.016													
		B-16	16.0-21.0	SM	9	76	15	0.06													
		B-20	26.0-28.2	SM	25	58	17	0.058													

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D10 mm	PL	LL		TOTAL	-NO4	STND AASHO OPT. WATER % DRY WT	STND AASHO MAX DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.
FD-53 Cont'd	546.7	J-22	30.0-31.4	ML	3	42	55	0.02													
		B-30	40.0-41.4	SM	23	48	29	0.017													
		B-37	49.0-50.0	SM	3	51	46	0.0052													
FD-54	571.5	B-4	1.0- 5.0	SM	40	49	11	0.07													
		B-8	6.0-10.0	SM	14	72	14	0.05													
		B-18	19.0-22.1	SM	15	72	13	0.055													
		B-22	26.0-29.5	SM	1	62	37	0.03													
		B-27	39.0-40.6	SM	37	47	16	0.049													
		B-32	46.0-48.0	SM	19	47	34	0.026													
FD-55	456.2	B-8	10.0-15.0	SP-SM	19	73	8	0.11													
		B-13	21.0-25.0	SM	36	50	14	0.05													
		B-18	32.0-35.0	SP-SM	41	48	11														
		J-19R	35.0-36.5	SM	42	45	13														
		B-24	40.0-43.0	GM	51	37	12	0.054													
		B-26	43.0-45.0	SM	18	45	37	0.0078													
		J-28R	46.0-49.0	SM					Non-Plastic												
FD-56	561.2	B-11	6.0-8.0	SM	26	60	14	0.05													
		B-16	11.6-14.0	SM	28	52	20	0.041													
		B-25	19.0-22.0	SM	2	61	37	0.027													
		J-29	25.7-26.7	SM													109.4	(plug)			
		B-30	25.7-26.7	SM	8	54	38	0.027													
		B-37	35.0-37.9	SP-SM	34	60	6	0.14													
		B-42	42.0-44.0	GP-GM	46	44	10	0.1													
		B-46	48.0-50.0	SM	37	48	15														
FD-57	570.0	B-5	5.0-10.0	SM	39	46	15	0.049													
		B-15	25.0-29.0	SM	1	55	44	0.025													
		J-16	29.0-31.0	SM													106.8	(plug)			

* PROVIDENCE VIBRATED DENSITY TEST

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
														STND AASHO							
					GRAVEL %	SAND %	FINES %	D_{10} mm	PL	LL		TOTAL	-NO 4	OPT. WATER % DRY WT	MAX DRY DENS LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO 4	SHEAR	CONSOL	PERM
FD-57 Contd	570.0	J-24	37.0-39.0	SM	W/occ. silt strata to 1/2"												111.5 (plug)				
		B-27	39.0-41.0	SP-SM	3	88	9	0.08													
		B-33	47.0-48.4	SM	5	78	17	0.05													
		J-34	49.0-50.0	SM	0	80	20	0.04													
FD-59	438.3	J-6R	5.8-10.0	GP-GM	51	39	10	0.074													
		J-11R	15.0-20.0	GP-GM	51	38	11	0.07													
		B-16	25.0-27.0	SM	39	48	13														
		B-22R	38.0-39.5	SM	31	37	32														
		B-26	41.5-44.8	SM	39	47	14														
FD-63	455.8	B-6	7.0- 9.4	GP-GM	47	46	7	0.11													
		B-9	10.0-14.2	SM	11	58	31														
		B-13	15.0-20.0	SM	41	46	13														
		B-17	22.2-25.0	GM	55	30	15														
		B-22	40.0-45.0	SM	23	39	38														
		B-27	50.0-52.3	SM	23	44	33														
		B-32	56.0-57.7	GP-GM	53	37	10	0.074													
FD-64		B-3	0.6- 3.8	GP-GM	62	32	6	0.14													
		B-9	10.0-15.0	SM	41	44	15														
		B-13	18.8-23.8	GM	43	40	17														
		B-19	30.0-35.0	SM	15	40	45														
		B-27	42.4-47.0	SM	13	38	49														
FD-65	438.73	B-8	7.5-10.0	GP-GM	51	40	9	0.08													
		B-17	25.0-27.4	GP-GM	56	37	7	0.11													
		B-28	39.0-41.2	SP-SM	35	58	7	0.1													
		J-30	47.7-51.4	SM	29	49	22														
		J-32	52.7-53.1	SM	15	62	23														

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST SUMMARY DATA

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D 10 mm.	PL	LL		TOTAL	- NO4	STND AASHO OPT. WATER % DRY WT	STND AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	- NO4	SHEAR	CONSOL.	PERM.	
FT-4	571.4	B-3	2.6- 8.0	SM	32	34	34	0.018														
FT-5	573.8	B-3	2.9- 8.0	SM	21	55	24	0.028														
FT-6	497.4	B-3	3.0-13.0	SM	39	41	20	0.031														
FT-7	508.4	B-3	2.9-12.0	SM	40	45	15	0.043														
FT-8	474.7	B-3	2.9-11.0	GP	49	47	4	0.29														
		B-5	11.0-13.0	GM	48	40	12	0.07														
FT-9	441.3	B-1	0.5- 5.8	SM	0	71	29															
FT-9	441.3	B-3	5.8-10.0	GP-GM	53	40	7	0.11														
FT-10	442.2	B-3	6.0-10.0	GM	50	37	13	0.054														
FT-11	438.3	B-3	5.5- 7.0	SP-SM	46	48	6	0.13														

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO		COMPACTION DATA	NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D10 mm.	PL	LL		TOTAL	- NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	- NO4	SHEAR	CONSOL	PERM.
BD-10	695.5	J-3R	0.6- 5.0	SM									11.5								
		B-4	5.0- 7.1	SM	11	44	45	0.0052	Non	-Plastic											
		J-5R	5.0- 7.1	SM									12.7								
		J-6	7.1-10.0	SM									11.5								
		B-7	10.0-12.4	ML-CL	9	33	58	0.0019	17	22	2.80										
		J-8R	10.0-12.4	ML-CL									12.0								
		J-9	12.4-15.0	ML-CL	13	33	54	0.003				11.5	12.0								
		B-12	17.0-17.8	ML-CL	9	36	55	0.0017													
		J-13R	17.0-17.8	ML-CL								12.1	12.8								
		J-16R	20.0-22.7	SM-SC								8.0	9.6								
		J-18R	22.7-25.0	SM-SC					18	23		9.6	9.9								
		J-21R	28.0-30.0	SM-SC								8.0	9.2								
		B-22	30.0-32.6	SM	23	31	46	0.0026	Non	Plas.	2.84										
		J-23R	30.0-32.6	SM								8.8	9.2								
		J-25R	32.6-35.4	SM								8.3	8.7								
		J-27R	38.0-38.6	SM								10.1	10.2								
		J-29R	40.0-40.6	SM								9.0	9.2								
		J-31R	42.0-43.0	SM					Non	Plastic		9.1	9.4								
		J-32R	43.0-44.2	SM								9.3	9.6								
		B-34	46.0-48.8	SM	20	36	44	0.005	Non	Plastic											
		J-35R	46.0-48.8	SM								8.6	8.8								
		B-39	53.0-55.0	SM	16	37	47	0.0049	"	"	2.82										
		J-40R	53.0-55.0	SM								9.1	9.6								
		J-42R	55.0-57.0	SM								6.9	7.8								
		J-44R	57.7-60.0	SM								9.3	10.5								
		B-47	65.0-70.0	GM-GC	34	28	38	0.0049	16	21											
		J-48R	65.0-70.0	SM-SC								9.5	10.0								
		J-51R	70.8-73.3	SM-SC								10.2	10.4								

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT.		COMPACTION DATA STND AASHO		*	NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} MM	PL	LL		TOTAL	NO 4	OPT WATER % DRY WT	MAX DRY DENS LBS/CU FT	PVD LBS/CU FT	TOTAL	NO 4	SHEAR	CONSOL	PERM.
BD-11	731.1	B-3	1.6- 5.0	ML	7	37	56	0.0028	19	20	2.82										
		J-4R	1.6- 5.0	ML								14.4	14.5								
		J-6R	5.0- 8.3	SM								14.3	14.6								
		B-8	10.9-15.0	SM	18	35	47	0.0043	Non	Plastic											
		J-12R	17.4-18.2	SM								10.8	11.8								
		B-14	20.0-21.3	SM	26	31	43	0.0043	18	21											
		J-15R	20.0-21.3	SM								12.1	13.1								
		J-17R	21.3-25.0	SM								10.7	11.1								
		B-18	25.0-30.0	SM	24	31	45	0.0024	18	21	2.80										
		J-19R	25.0-30.0	SM								10.7	11.5								
		J-21R	30.0-31.1	ML								14.0	14.4								
		J-23R	31.1-35.0	SM								9.3	11.0								
		B-24	35.0-37.7	SM	29	28	43	0.0021	18	21											
		J-25R	35.0-37.7	SM								9.9	11.6								
		J-26	37.7-40.0	SM								11.8	12.5								
		J-28R	40.0-44.4	SM-SC								9.9	10.8								
		J-31R	46.0-50.0	SM-SC								10.1	11.5								
		B-32	50.0-55.0	SM-SC	23	32	45	0.002	18	22											
		J-33R	50.0-55.0	SM-SC								14.5	15.1								
		J-35R	55.0-58.0	SM-SC								12.4	13.3								
		J-37R	58.5-60.0	SM-SC								14.9	15.6								
		B-38	60.0-65.0	SM-SC	23	30	47	0.012													
		J-39R	60.0-65.0	SM-SC								11.2	12.4								
		J-41R	65.0-70.0	SM-SC								10.4	13.3								
		J-43R	70.0-75.0	SM-SC								9.8	11.5								
		J-45R	75.0-80.0	GM-GC								12.6	17.1								
		J-47R	80.0-85.0	SM-SC								13.1	14.9								
		B-48	85.0-89.0	SM-SC	26	34	40	0.002													
		J-49R	85.0-89.0	SM-SC								9.4	10.6								
		J-51R	89.0-90.0	SM-SC								9.9	10.3								
		J-53R	90.0-95.0	SM-SC								10.8	11.3								
		J-55R	95.0-96.4	SM-SC								9.9	10.5								
		B-44	75.0-80.0	GM-GC	28	27	45	0.0014	18	24											

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST SUMMARY DATA

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm	PL	LL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX DRY DENS LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.	
B-11 Continued																						
		B-57	97.8-100.0	SM-SC	22	36	42	0.002	15	20												
		J-58R	97.8-100.0	SM-SC								9.6	11.1									
		J-60R	100.0-105.0	"								8.0	8.9									
		B-61	105.0-110.0	"	16	41	43	0.0013														
		J-62	110.0-115.0	"								9.3	9.9									
		J-64R	110.0-115.0	"								15.1	15.5									
		B-65	115.0-120.0	"	13	45	42	0.0021	16	21												
		J-66R	115.0-120.0	"								13.9	14.3									
		J-68R	120.0-122.1	"								15.1	17.7									

* PROVIDENCE VIBRATED DENSITY TEST.

TEST DATA SUMMARY

EXPL. NO	TOP ELEV FT.	SAMPLE NO	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS GRAVEL %	SAND %	FINES %	D_{10} mm	ATT. LIMITS PL	LL	SPECIFIC GRAVITY	NAT WATER CONTENT % DRY WT TOTAL	NO 4	COMPACTION DATA STND AASHO OPT. WATER % DRY WT	MAX DRY DENS LBS/CU FT	* PVD LBS/CU FT	NAT DRY DENSITY LBS/CUFT TOTAL	NO 4	OTHER TESTS SHEAR	CONSOL	PERM	
BD-12	751.5	J-2R	1.2- 3.1	SM								20.3	21.9									
		J-4R	3.1- 5.0	SM								13.0	14.9									
		J-6R	5.0- 9.4	SM								10.6	14.0									
		B-7	5.0- 9.4	SM	26	49	25	0.026														
		J-8R	9.4-10.0	SM								11.4	11.8									
		J-9R	10.0-13.0	SM								12.1	12.5									
		B-10	10.0-13.0	SM	11	42	47	0.0036	Non Plastic													
		J-11R	13.0-15.0	GM								8.1	8.5									
		J-13R	15.0-19.0	ML								9.4	9.9									
		B-14	15.0-19.0	ML	10	38	52	0.002														
		J-15R	19.0-20.0	ML								9.6	10.8									
		J-17R	20.0-23.0	ML								9.5	10.8									
		J-19R	23.0-25.0	ML								9.6	10.0									
		J-21R	25.0-26.0	ML								10.6	11.1									
		J-23R	26.0-28.7	ML								8.1	9.7									
		B-24	26.0-28.7	ML	11	37	52	0.002	16	19												
		J-26R	30.0-31.8	ML								9.3	10.1									
		J-29R	32.4-35.0	ML								8.9	10.7									
		B-31	35.0-37.8	ML-CL	16	33	51	<0.001														
		J-32R	37.8-40.0	ML-CL								9.5	9.9									
		B-35	40.0-43.0	ML-CL	11	35	54	<0.001	17	22												
		J-36R	43.0-45.0	ML-CL								8.2	8.7									
		B-39	45.0-48.2	SM-SC	19	32	49	0.0012	17	24												
BD-14	628.2	J-3R	3.0- 5.0	GM								14.9	17.0									
		B-4	5.0-10.0	ML	14	35	51	0.005	20	21												
		J-4R	5.0-10.0	ML								13.1	14.5									
		B-5	10.0-15.0	ML	13	34	53	0.0025	19	22												
		J-5R	10.0-15.0	ML								14.3	14.5									
		J-6R	15.0-20.0	SM-SC								10.5	12.6									
		B-7	20.0-25.0	SM-SC	24	29	47	0.0017	18	22												

* PROVIDENCE VIBRATED DENSITY TEST.

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
														STND. AASHO							
					GRAVEL %	SAND %	FINES %	D10 mm.	PL	LL		TOTAL	- NO 4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	- NO 4	SHEAR	CONSOL.	PERM.
BD-14 Continued																					
		J-7R	20.0-25.0	SM-SC								11.6	12.3								
		B-9	30.0-35.0	SM-SC	24	36	40	0.0038	17	21											
		J-9R	30.0-35.0	SM-SC								9.2	11.1								
		J-10R	35.0-40.0	SM-SC								9.1	12.3								
		J-8R	25.0-30.0	SM-SC								8.8	10.0								
BD-15	609.0	J-6R	7.2-10.0	SM								15.2	15.7								
		B-7	7.2-10.0	SM	13	41	46	0.0042	20	22											
		J-8R	10.0-12.5	SM								19.4	22.0								
		J-11R	15.0-20.0	GM								13.0	13.7								
		B-12	15.0-20.0	GM	41	27	32	0.008	18	21											
		J-13R	20.0-24.0	SM-SC								8.7	9.0								
		B-14	20.0-24.0	SM-SC	18	37	45	0.0021	16	21											
		J-16R	24.0-25.0	SM-SC								9.4	9.7								
		J-17R	25.0-28.0	SM								10.0	10.8								
		J-20R	30.0-33.0	SM								10.6	11.3								
		B-21	30.0-33.0	SM	7	51	42	0.006	Non	Plastic											
		J-22R	33.0-33.9	SM								9.2	10.7								
		J-25R	35.7-40.0	SM-SC								8.7	9.3								
		B-26	35.7-40.0	SM-SC	12	45	43	0.003	17	22											
BD-16	770.1	B-5	5.0-10.0	GM	33	29	38	0.0095	Non	Plastic											
		J-6R	10.0-15.0	SM								11.9	12.3								
		J-9R	16.0-20.0	ML								7.8	8.4								
		B-10	16.0-20.0	ML	10	33	57	0.0012													
		J-11R	20.0-25.0	SM								9.2	9.3								
		J-13R	25.0-29.2	SM								9.1	9.2								
		J-18R	32.0-35.0	SM								10.3	10.9								
		B-19	32.0-35.0	SM	15	42	43	0.004	Non	Plastic											
		J-20R	35.0-38.0	SM								11.0	11.1								
		J-22R	38.0-40.0	SM								11.6	11.8								
		J-24R	40.0-45.0	SM								8.5	9.3								
		J-26	45.0-48.0	SM								7.9	8.6								

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D10 mm.	PL	LL		TOTAL	-NO4	STND. AASHO OPT. WATER % DRY WT	STND. AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.
BD-16 Continued																					
		B-27	45.0-48.0	SM	17	40	43	0.0034													
		J-30R	51.3-53.1	SM								8.5	9.5								
		J-34R	55.0-58.0	SM								9.1	9.7								
		B-35	55.0-58.0	SM	19	37	44	0.0025	Non	Plastic											
		J-36R	58.0-60.0	SM								8.3	9.1								
		J-38R	60.0-62.0	SM								7.9	9.0								
		J-40	62.0-65.0	SM								9.3	10.5								
		B-41	62.0-65.0	SM	20	42	38	0.0041													
		J-43R	67.0-69.8	SM								7.9	9.3								
		J-46	73.4-75.0	SM								8.9	9.5								
		B-48	75.0-76.5	SM	18	50	32	0.0062	Non	Plastic		9.1	10.3								
BD-17	747.8	J-3R	2.7- 5.0	SM								18.8	21.1								
		B-6	5.0-10.0	SM	31	45	24	0.025	Non	Plastic											
		J-7R	10.0-15.0	SM								13.1	13.4								
		B-10	15.0-20.0	SM	15	43	42	0.006													
		J-11R	20.0-25.0	SM								8.8	9.2								
		B-14	25.0-30.0	SM	17	47	36	0.014													
		J-15R	30.0-32.0	SM								8.5	9.1								
		J-17R	32.0-34.2	SM								8.0	8.1								
		J-20R	35.0-37.0	SM								9.6	10.7								
		B-21	35.0-37.0	SM	19	44	37	0.0071	Non	Plastic											
		J-24R	38.8-40.0	SM								14.7	18.3								
		J-25R	40.0-41.7	SM								15.7	15.9								
		J-26	40.0-41.7	SM	9	55	36	0.016													
		J-27	41.7-43.0	SM								15.7	17.2								
BD-18	465±	B-5	5.0-10.0	SP-SM	44	45	11														
		B-7	10.0-15.0	SP-SM	27	64	9	0.088													

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm	PL	LL		TOTAL	- NO 4	STND AASHO OPT. WATER % DRY WT	STND AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	- NO 4	SHEAR	CONSOL	PERM.	
BD-19	460±	B-2	1.4- 5.0	GP-GM	58	34	8	0.09														
		B-10	15.0-20.0	GM	49	39	12															
		B-12	20.0-25.0	SP-SM	26	67	7	0.094														
BD-20	455±	B-4	5.0-10.0	GP-GM	53	37	10	0.074														
		B-6	10.0-15.0	SP-SM	33	56	11															
BD-21	454±	B-8	5.0-10.0	GM	52	36	12															
BD-22	450±	B-7	5.0-10.0	GP	66	30	4	0.24														
		B-9	10.0-14.3	GP-GM	47	42	11															
		B-12	15.0-17.0	SM	6	66	28															
		B-16	20.0-25.0	GP-GM	62	30	8	0.09														
BD-23	445±	B-2	0.0-5.0	SM	0	80	20															
		B-5	5.6-10.0	GP-GM	55	37	8	0.091														
		B-9	15.0-20.0	GP-GM	53	36	11															
BD-24	465±	B-6	5.0- 9.6	GP	57	38	5	0.19														
		B-9	10.0-13.4	GW-GM	53	42	5	0.17														
BD-27	467±	B-4	5.0- 7.8	SP-SM	27	65	8	0.1														
		B-8	10.0-15.0	GW-GM	46	41	11															
BD-28	475±	B-9	10.0-13.9	GP-GM	64	28	8	0.1														
BD-29	472±	B-3	5.0-10.0	GP-GM	64	31	5	0.2														
BD-31	490±	B-8	6.2-10.0	GP-GM	56	36	8	0.1														
		B-10	10.0-13.5	GW-GM	55	39	6	0.15														

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	PL	LL		TOTAL	-NO4	STND AASHO OPT. WATER % DRY WT	STND AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM
BT-3	690±	B-2	3.4-11.4	SM	17	38	45	0.0044	20	21	2.80			11.9	123.1						
		UC-4	3.4-11.4									12.5	14.1				125.9				
		UC-6	3.4-11.4									13.2	14.6				121.4				
		UC-8	3.4-11.4									15.6	16.6				113.8				
		UC-10	3.4-11.4									13.6	15.1				119.5				
		B-11	11.4-15.0	SM	20	31	49	0.0025	18	21	2.82			10.5	127.3						
		UC-12	11.4-15.0									13.2	14.8				122.3				
		UC-14	11.4-15.0									12.8	15.0				125.1				
		UC-18	11.4-15.0									12.5	14.9				125.8				
		UC-22	11.4-15.0									11.2	12.4				130.4				
BT-4	456.2	B-2	2.7- 8.1	GP	68	29	3	0.42													
		B-3	9.7-12.3	SP	46	50	4	0.15													
BT-5	459.6	B-2	2.2- 8.5	GP-GM	68	22	10	0.74													
		B-3	8.5-10.6	SP	2	95	3	0.13													
		B-4	10.6-12.0	SP	32	65	3	0.16													
BT-6	462.1	B-2	3.1-11.6	GP	63	35	2	0.42													
BT-7	464.0	B-2	1.5- 7.2	SP	47	49	4	0.16													
		B-3	7.2- 8.3	ML	0	50	50														
		B-4	8.3-10.5	SP-SM	36	55	9	0.08													
BT-8	468.3	B-2	2.1- 9.6	SM	34	50	16														
BT-9	460.3	B-2	2.3- 3.5	GP	56	41	3	0.21													
		B-3	3.5- 4.8	SP	0	98	2	0.20													
		B-4	4.8-11.2	GP	55	40	5	0.15													

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO		COMPACTION DATA	NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	PL	LL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.
BT-10	458.2	B-3	3.9-10.0	GP-GM	51	42	7	0.13													
BT-11	453.8	B-2	3.9- 9.6	GP	60	36	4	0.17													
BT-12	481.4	B-2	2.3- 7.4	SP	28	68	4	0.21													
		B-3	7.4-11.5	SM	12	61	27														
BT-13	475.9	B-1	0.6- 9.5	GP	70	29	1	0.7													
BT-14	477.3	B-1	0.8- 3.7	SM	0	84	16														
		B-2	3.7-10.6	GP	58	40	2	0.4													
BT-15	491.5	B-2	2.3- 3.8	GP	65	31	4	0.17													
		B-3	3.8- 7.1	GP	57	39	4	0.19													
		B-4	7.1-10.5	GP-GM	62	33	5	0.14													
BT-18	477.6	B-3	5.1- 7.0	GP	65	33	2	0.56													
		B-4	7.1-10.6	GP	59	38	3	0.3													
BT-19	475.2	B-2	5.1- 7.0	GP	63	35	2	0.6													
		B-3	7.0-11.0	SP-SM	41	53	6	0.12													
BT-20	480.2	B-1	0.6- 2.9	SP-SM	10	81	9	0.09													
		B-2	2.9- 6.2	GP	60	39	1	0.5													
		B-3	6.2-14.0	GP	64	34	2	0.56													
BT-21	470.6	B-1	0.6- 2.0	GP	69	29	2	0.47													
		B-2	2.1- 5.2	SP-SM	0	88	12														
		B-3	5.2- 6.8	GP	74	25	1	0.79													
		B-4	6.8-11.7	GP	61	36	3	0.21													

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO		COMPACTION DATA	NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	- NO4	OPT. WATER % DRY WT	MAX DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	- NO4	SHEAR	CONSOL	PERM.	
BT-22	488.5	-	-																			
		B-2	2.5- 6.0	GP	63	34	3	0.35														
		B-3	6.1- 8.0	GP	65	32	3	0.26														
		B-4	8.4-13.2	GP-GM	54	40	6	0.22														
BT-23	492.1	B-2	2.8- 9.3	GP-GM	52	41	7	0.17														
BT-24	477.5	B-2	4.3- 7.8	GP	66	33	1	0.69														
		B-3	7.8-12.3	GP	59	38	3	0.28														
BT-25	474.3	B-1	0.4- 2.0	GP	59	38	3	0.46														
		B-2	2.1- 2.8	SP-SM	0	98	8	0.09														
		B-3	3.2- 5.4	GP	60	37	3	0.46														
		B-4	5.4-11.9	GP	68	29	3	0.5														
BT-26	479.7	B-2	4.9- 7.6	GP	81	17	2	5.1														
		B-3	7.6-10.8	SP-SM	44	50	6	0.13														
BT-27	482.6	B-2	3.4- 5.3	GP-GM	49	46	5	0.095														
		B-3	5.3- 9.8	GP-GM	57	36	7	0.15														
BT-28	472.9	B-2	3.2- 7.0	SP	48	50	2	0.35														
		B-3	7.0-10.8	GP	55	43	2	0.28														

* PROVIDENCE VIBRATED DENSITY TEST.

SECTION 1

PREPARATION OF SITE
(ITEM 1)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
1-01	Scope	1-1
1-02	Removal of Existing Structures	1-1
	a. General	1-1
	b. Disposal	1-1
1-03	Clearing and Grubbing	1-1
	a. General	1-1
	b. Clearing	1-1
	c. Grubbing	1-2
	d. Disposal	1-2
1-04	Payment	1-2

SECTION 1

PREPARATION OF SITE

(ITEM 1)

1-01. SCOPE. - Work covered by this section of the specifications consists in furnishing all plant, labor, equipment, and appliances and in performing all operations in connection with the preparation of the various sites of work, except the borrow areas, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract. Clearing of reservoir is not included under the contract.

1-02. REMOVAL OF EXISTING STRUCTURES. - a. General. - The contractor shall remove all structures and all fences and above ground stone walls within the areas (as specified in Paragraph 1-03) to be cleared. All structures to be removed are indicated on the contract drawings. All basements, cisterns, walls, etc., outside of the Permanent Works and within the work limits, shall be filled.

b. Disposal. - The structures removed under this paragraph of the specifications shall become the property of the contractor, and shall be removed in their entirety off the site of the work or disposed of in designated waste areas as directed. Stone, subject to approval, may be salvaged and used in the permanent work.

1-03. CLEARING AND GRUBBING. - a. General. - Clearing shall consist of the satisfactory felling and removal of all trees and vegetation (except grass) together with down timber, snags, brush and rubbish occurring within the limits of the areas to be cleared. Grubbing shall consist of the below ground removal and disposal of all natural growth, buried logs, down timber, brush, snags and other objectionable material and vegetation other than grass and leaves from the areas specified.

b. Clearing. - The areas to be cleared shall include all existing uncleared areas at the site of all new permanent works, graded areas, and spoil areas, together with a 10 foot strip (unless otherwise specified) measured horizontally beyond and contiguous thereto for the foundation areas for dam and dike and all other fill areas, and a 5 foot strip measured horizontally beyond and contiguous thereto for all cut sections and as indicated for the log boom, and to the limits shown on the drawings. The width of the strip to be cleared beyond the foundation area of the dam shall be 50 feet on the downstream side and 100 feet on the upstream side, both measured horizontally. Where indicated on the drawings, all existing slopes steeper than 1 on 3 shall be cut back to 1 on 3 in cleared area below Elevation 520. Where grubbing is not specified or required, stumps shall be left not more than 6 inches higher than the existing ground.

c. Grubbing. - The areas to be grubbed include the foundation areas for the dam and dike and the areas of all cuts. The areas of the fill for the road relocation whenever the fills are 3 feet or less in height shall be grubbed. Also included in areas to be grubbed are the areas of a strip 10 feet wide to be measured horizontally and contiguous to the above described areas to be grubbed and areas of a strip 5 feet wide to be measured horizontally and contiguous to the limits of all cut Sections. In grubbing out stumps, all tap and lateral roots or other growth over 1-1/2-inches in diameter shall be removed to a depth of 1-1/2-feet below the stripping line in areas to be stripped and to a depth of 1 foot below the ground surface in grubbing areas not to be stripped. In stripping areas within previously wooded areas, as determined by the Contracting Officer, roots with a diameter greater than 1/2-inch shall be removed for a depth of 8 inches by the use of an approved root raker or scarifier after the stripping operations are completed. The rooting or scarifying operation shall be repeated as often as considered necessary by the Contracting Officer to insure satisfactory removal of roots. After each operation, exposed roots on the surface shall be removed prior to the succeeding operation.

d. Disposal. - All materials removed during the clearing and grubbing operations shall be disposed of by burning or removal to approved disposal areas outside of the reservoir area, unless otherwise authorized, except that merchantable timber shall become the property of the contractor and shall be removed from the site of the work. No material shall be thrown into or left along the banks of the river. The disposal of material shall closely follow the removal thereof so that in case of high water, a minimum of debris and brush will be washed downstream. At no time shall such material be placed on land outside the work areas. The contractor shall be responsible for compliance with all Federal and State Laws and regulations relative to the building of fires. Disposal by burning shall be under constant attendance until fires have burned out or have been extinguished. Whenever Elm trees are cut, all portions of the trees which are neither buried as directed or burned shall be thoroughly sprayed with a two percent emulsion of DDT.

1-04. PAYMENT. - Except as noted below, payment for all work in connection with the preparation of site as specified above will be made at the contract lump sum price for Item No. 1, "Preparation of Site". The lump sum price shall reflect the salvage value of the merchantable timber to be removed. Payment for clearing borrow areas shall be included in the applicable contract unit price for unclassified excavation in borrow areas. Payment for filling holes due to removal of stumps, and existing structures within the limits of the areas to be grubbed will be paid for at the applicable contract price for the type of fill material used.

SECTION 2

CONTROL AND DIVERSION OF WATER
(ITEM 2)
(INDEX)

Paragraph No.	Paragraph Title	Page No.
2-01	Scope	2-1
2-02	Diversion Plan	2-1
2-03	Auxiliary and Temporary Upstream and Downstream Cofferdams	2-1
2-04	Materials	2-2
	a. Permanent Cofferdams	2-2
	b. Auxiliary and Temporary Cofferdams	2-2
2-05	Overtopping of Permanent Cofferdams	2-2
2-06	Payment	2-2

SECTION 2

CONTROL AND DIVERSION OF WATER
(ITEM 2)

2-01. SCOPE. - The work covered by this section of the specifications consists in furnishing all plant, labor and appliances, and in performing all operations in connection with diverting and controlling the river and dewatering the construction areas within the limits of permanent works or structures, so that these structures may be constructed in the dry, unless otherwise specified, all in accordance with this section of the specifications. The work under this section shall also include the installation of well points, wells, etc., to lower the water table as specified in Section 3, "EXCAVATION - OPEN CUT".

2-02. DIVERSION PLAN. - The plan of diversion provides for the placement of all embankment material in the dam and dike in the dry. Operations shall be accomplished in sequence as follows:

a. The first stage of the work shall consist of the construction of the water supply pipe and diversion conduit and the completion of the lower portion of the water supply intake up to Elevation 505 msl. Upon completion of the foregoing and the relocation of East River Road, auxiliary cofferdams shall be constructed, the river diverted through the conduit, and the foundation area of the dam embankment dewatered. The relocation of East River Road will be completed by others on or about 1 August 1963.

b. After the diversion of the river, the contractor shall complete the initial excavation for the foundation cut-off for the dam within the limits shown on the drawings; construct the grout curtain in the excavated portion of the cut-off trench; prepare the bedrock surface exposed in the trench in accordance with Section 3, "EXCAVATION - OPEN CUT"; and place impervious fill in the trench in the valley up to a level 5 feet above the level of the adjacent ground after stripping in accordance with Section 7, "EMBANKMENTS". In connection with the foregoing, attention is directed to the provisions of Section 3, "EXCAVATION - OPEN CUT" which require that well points, wells, and similar devices be employed during the initial excavation of the foundation cut-off so that all work may be done in the dry.

c. After completion of the work outlined in b. above, the contractor shall proceed to construct the permanent cofferdam to Elevation 505 msl. All material for the permanent cofferdam, including rock slope protection, shall be placed in the dry.

2-03. AUXILIARY AND TEMPORARY UPSTREAM AND DOWNSTREAM COFFERDAMS. - Auxiliary and temporary upstream and downstream cofferdams shall be designed and constructed by the contractor who shall select the location, type of construction and height. Any damage to permanent work resulting from overtopping or other failure of such structures or by flooding shall be repaired by the contractor at his own expense and at no additional cost to the Government.

2-04. MATERIALS. - a. Permanent Cofferdam. - All material placed within the limits of the permanent cofferdam shall conform to the requirements of Sections 3, 7 and 8 and shall remain in place to form part of the permanent work, in which case payment will be made to the applicable payment lines. Payment for stripping for permanent cofferdam will be measured and paid for under Section 3, "UNCLASSIFIED EXCAVATION - GENERAL".

b. Auxiliary and Temporary Cofferdams. - No payment will be made for stripping foundation areas of auxiliary and temporary cofferdams and for furnishing and placement of any cofferdam material used in auxiliary and temporary cofferdams. The contractor will not be permitted to use any material from required excavations and from borrow in auxiliary and temporary cofferdams which are suitable for embankments and fills. Material for auxiliary and temporary cofferdams shall be material specified or indicated to be placed in spoil areas or materials obtained from Borrow Area D, as indicated on the drawings. All materials placed in auxiliary and temporary cofferdams shall be removed prior to completion of the work.

2-05. OVERTOPPING OF PERMANENT COFFERDAM. - If the water rises and overtops the permanent cofferdam that has been satisfactorily constructed and maintained to the effective elevation shown on the drawings, or specified, resulting in injury to the permanent work within the protected area during the same construction season that diversion is effected, the contractor shall repair all damages so ordered by the Contracting Officer. If the water overtops the embankment after all fill has been satisfactorily placed, the contractor shall repair all damages as directed by the Contracting Officer. Payment of the cost of such repairs will be in accordance with the provisions of Paragraph SC-15 and Paragraph 2-06.

2-06. PAYMENT. - a. The contract lump sum price for Item 2, "Control and Diversion of Water" shall include payment for control, diversion and care of the river during construction; the construction, maintenance and removal of auxiliary and temporary cofferdams, including the rebuilding of auxiliary and permanent cofferdams in case of destruction by flood, except as otherwise provided below. The lump sum contract prices for Item 2 shall also include all costs in connection with the requirements for lowering the water table and dewatering during the initial construction of the dam cut-off as specified in Section 3, "EXCAVATION- OPEN CUT".

b. The contract price shall also include the costs for all pumping drainage and dewatering necessary to obtain and maintain in a dry condition all excavation and work areas, removal of trash and debris, and maintenance of unobstructed flow prior to diversion, and through diversion channels during the remaining period of the contract.

c. Estimates for partial payments for this work will be as follows: Forty-five percent of the contract price when the Middle Branch, Westfield River has been diverted and all cofferdams have been constructed as specified; forty-five percent of the contract price when the entire working area for the dam and dike has been unwatered and the embankments completed to Elevation 596; and ten percent of the contract price when all cofferdams have been disposed of as specified.

d. If, in the opinion of the Contracting Officer, damage to the permanent works under other items of work is caused by the contractor's negligence in the construction and maintenance of the cofferdams, the repairs to the permanent works shall be made by the contractor at no additional expense to the Government.

SECTION 3

EXCAVATION - OPEN CUT
(Items 3, 4, 5, 6, 9, 10, 11, 13 and 14)
(INDEX)

Paragraph No.	Paragraph Title	Page No.
3-01	Scope	3-1
3-02	General Provisions	3-1
	a. Utilization of Materials	3-1
	b. Disposal of Excess and Unsuitable Materials	3-2
	c. Stockpiling	3-2
	d. Shoring and Sheeting, Safety Mesh and Rock Bolting	3-2
	e. Temporary Drains, Pumping, and Unwatering	3-3
	f. Stones in Excavations	3-3
	g. Salvage of Stripping Material for Topsoil	3-3
3-03	Classification	3-4
3-04	Unclassified Excavation, General	3-5
	a. General	3-5
	b. Stripping	3-5
	c. Grading	3-5
	d. Initial Reach for Dam Foundation Cut-Off	3-5
	e. Foundation Drains and Final Reach of Dam Foundation Cut-Off	3-6
	f. Service Bridge	3-7
3-05	Cleaning of Bedrock Surfaces	3-7
	a. General	3-7
	b. Machine Cleaned	3-7
	c. Hand Cleaned	3-7
3-06	Unclassified Excavation, Borrow	3-8
	a. General	3-8
	b. Borrow Area B	3-9
	c. Borrow Areas C and E	3-10

Paragraph No.	Paragraph Title	Page No.
3-07	Rock Excavation	3-10
	a. General	3-10
	b. Final Grades and Excavation Lines	3-11
	c. Blasting	3-11
	d. Benches	3-12
	e. Definition of Lines	3-12
	f. Rock Foundation Preparation	3-13
3-08	Rock Excavation, Borrow	3-14
3-09	Safety Mesh	3-14
3-10	Slides	3-15
3-11	Line Drilling	3-15
	a. Work Included	3-15
	b. Description	3-15
3-12	Measurement	3-15
	a. Unclassified Excavation, General	3-15
	b. Unclassified Excavation, Borrow	3-16
	c. Rock Excavation	3-16
	d. Rock Excavation, Borrow	3-16
	e. Safety Mesh	3-16
	f. Line Drilling	3-17
	g. Machine Cleaned Bedrock Surfaces	3-17
	h. Hand Cleaned Bedrock Surfaces	3-17
3-13	Payment	3-17
	a. Unclassified Excavation, General	3-17
	b. Unclassified Excavation, Borrow	3-17
	c. Rock Excavation	3-18
	d. Safety Mesh	3-18
	e. Line Drilling	3-18
	f. Machined and Hand Cleaned Rock Surfaces	3-18

SECTION 3

EXCAVATION - OPEN CUT

(Items 3, 4, 5, 6, 9, 10, 11, 13 and 14)

3-01. SCOPE. - a. The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, and appliances, and of performing all operations in connection with all excavations and cleaning of bedrock surfaces, except as noted below, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract. This section of the specifications does not cover excavations for (1) buildings, (2) utilities, drains, and culvert, and (3) the foundations and removal of auxiliary cofferdams, outside the limits of permanent work. The requirements for these excepted excavations are covered in other sections of these specifications.

b. The term "required excavation" as used in this section is defined as any or all excavations covered in this section other than those in the borrow areas.

3-02. GENERAL PROVISIONS. - a. Utilization of Materials. - All excavated materials shall be satisfactorily disposed of as directed. With the exception of unsuitable materials and materials in excess of those required for the construction of the permanent work, all excavated materials shall be utilized in the permanent work including permanent cofferdams. The only excess material will be stripping material not required for producing topsoil. Only materials unsuitable for use in the construction of embankments and for topsoil shall be used in constructing auxiliary and temporary cofferdams. The Contracting Officer shall be the sole judge as to the suitability of all materials. Materials shall not be spoiled unless specifically authorized. Materials from required excavations and from borrow areas shall be utilized in the permanent work as specified in other sections of these specifications. The contractor shall conduct the work in a manner to utilize all suitable materials from the required excavations except that earth materials from the required excavation for the dam foundation cut-off within the initial limits shown on the drawings which is in excess of that required for the completion of construction of the random section of the dike may be placed in the spoil areas. To insure the greatest possible use of materials from required excavations, all required excavations on the project, except the excavations for the foundation drain of the dike, for the construction of the conduit, and for the dam foundation cut-off within the initial limits shown on the drawings, shall be deferred until materials from these excavations can be used for the construction of embankment and other fills unless the contractor stockpiles suitable fill material at his own expense.

b. Disposal of Excess and Unsuitable Materials. - Excess and unsuitable material from required and borrow excavations shall be spoiled only when specifically authorized. All materials which are authorized to be spoiled shall be disposed of in the spoil areas shown on the drawings and in excavated portions of borrow areas designated herein as spoil areas. Prior to placement of materials, the foundation areas of all spoil areas shall be cleared of all standing timber leaving no stumps higher than 3 feet above the adjacent ground surface and the material thus obtained shall be disposed of as specified in section 1, "PREPARATION OF SITE", for materials obtained from other clearing operations. No separate payment will be made for clearing spoil areas, payment for which will be included in that made for excavation of the materials from their original sources. Spoil materials shall be placed to the lines and grades shown on the drawings or as directed. All spoil areas shall be graded to the final limits shown on the drawings or as directed so as to provide sightly and smooth surfaces sloped for suitable drainage.

c. Stockpiling. - The contractor shall stockpile stripping, topsoil, rock slope protection, and other materials from required and borrow excavations as required for the execution of the work. In addition, the contractor may stockpile materials for his own convenience subject to prior approval. All materials to be stockpiled shall be placed in approved stockpile areas which have been cleared, grubbed, and graded. Stockpiles of random fill material shall be located in approved well drained areas and the surfaces of the stockpiles at all times shall be graded for drainage and rolled so as to be smooth and relatively watertight. Stockpiles of rock slope protection material shall be maintained free of earth and shall be constructed in layers in such a manner as to prevent segregation. Each layer of stockpiled rock slope protection material shall be formed by dumping loads of the materials directly upon the surface of the previous layer. The dumped loads shall be levelled only to the extent necessary to form a base for the next layer. No separate payment will be made for the placement of materials in stockpiles or their excavation therefrom, for the grading of stockpile areas before placement and after removal of the materials. Payment for all work in connection with stockpiling materials under this contract shall be included in the contract unit price per cubic yard for the excavation of the materials from their original sources. Stockpiled material in excess of the quantity used in the permanent work shall be removed and placed in designated spoil areas unless the stockpile area is approved as a spoil area.

d. Shoring and Sheeting, Safety Mesh and Rock Bolting. - The contractor shall be responsible for the unfinished work, and for the safety of workmen from danger of caving, slides and rockfalls unless otherwise specified. Shoring and sheeting may be used at the option of the contractor, except that if considered necessary and the contractor does not use them, their use will be ordered at no additional cost to the Government. Shoring and sheeting shall not be used for excavations which are to be filled or backfilled with compacted materials unless specifically authorized. Shoring and sheeting shall be erected in a safe and workmanlike manner, in accordance with the requirements of the Corps of Engineers Manual, "General Safety Requirements", and shall be placed in such a way as to afford an ample clearance for ready inspection of permanent work. Sheeting shall be so constructed and carried to such depths as to prevent excessive inflow of water and intrusion of sand and other materials into the area being excavated. Shoring and sheeting shall be removed upon completion of the permanent work as soon as the construction does not require its use. Where shoring and sheeting are used in lieu of excavations to full dimensions of the pay lines, measurement will be taken to the payment lines as shown on the drawings. Safety mesh shall be installed as specified elsewhere in this section of the specifications. Rock bolts shall be installed in the scaled rock faces as specified in Section 5, "ROCK BOLTING". Precautions shall be taken to insure the safety of personnel from hazards of rock falls or rock slides.

e. Temporary Drains, Pumping, and Unwatering. - The contractor shall maintain the sites of work and adjacent grounds in a well-drained condition. Temporary drains and ditches required shall be constructed by the contractor at no additional expense to the Government. The contractor shall provide all necessary equipment and materials and shall unwater and maintain in a dry condition the foundation areas for the various features of work to the extent required by the provisions in this and other sections of the specifications for excavation, preparation of foundation for the dam and dike, grouting, placement of fill, backfill, and all materials in the dam, and dike and other fills and for the construction of concrete structures. Payment for pumping, unwatering, and lowering the ground water table for various features shall be included in applicable payments for excavations of materials unless otherwise designated.

f. Stones in Excavations. - Boulders and stones will be encountered during unclassified excavation. Boulders and stone encountered in required excavations shall be disposed of as directed. Stones and boulders shall be removed from random and impervious fill materials prior to compaction and shall be utilized in rock slope protection as specified in Section 7, "EMBANKMENTS", of these specifications. Stones and boulders removed from material during borrow excavation shall be disposed of within the excavated portions of the borrow area in an approved manner to form sightly piles.

g. Salvage of Stripping Material for Topsoil. - To the extent required, portions of stripping material shall be processed for topsoil in accordance with Section 43, "TOPSOILING, SEEDING, AND MULCHING", of these specifications.

3-03. CLASSIFICATION. - Except as otherwise prescribed, excavations will be classified as follows:

a. Unclassified Excavation. - Unclassified excavation shall comprise the satisfactory removal of all materials including those removed with the aid of drilling and blasting, except the materials removed as rock excavation as defined in subparagraph b below.

b. Rock Excavation. - Rock excavation shall consist of the satisfactory removal of the following:

(1) Boulders or rock blocks detached from bedrock measuring 3 cubic yards or more in volume in overburden materials to be excavated in the rock borrow area and 2 cubic yards or more in volume to be excavated elsewhere.

(2) Bedrock which, as determined by the Contracting Officer, can be removed only by systematic and continuous drilling and blasting. Excavation of bedrock will not be classified as rock excavation where the bedding or fracture system of the bedrock is such that it can be removed in a practicable manner with power equipment such as a shovel or a rooter. Excavation will not be classified as rock excavation as a result of the intermittent drilling and blasting performed by the contractor to increase production.

c. Where material is encountered for which the contractor claims classification as rock excavation for its removal, such material shall be uncovered and exposed and the Contracting Officer notified before proceeding with its excavation. The contractor shall not proceed with the excavation of such material until it has been cross-sectioned and classified by the Contracting Officer. Failure on the part of the contractor to uncover and expose such material, to notify the Contracting Officer, and allow time for cross-sectioning the undisturbed surface of such material will forfeit the contractor's right of claim to any classification other than that allowed by the Contracting Officer for the areas of work in which such materials occur.

d. Stripping. - Stripping shall consist of the removal of superficial materials judged by the Contracting Officer to be unsatisfactory for use as foundation materials or for use in the construction of fills which materials shall include sod, topsoil, stones, swamp deposits, organic materials, artificial fills, road pavements, base courses for pavements, all loose rock on the surface and other materials judged by the Contracting Officer as objectionable. Stripping shall be unclassified excavation except for the removal of boulders or detached rock blocks measuring 2 cubic yards or more in volume which will be rock excavation.

3-04. UNCLASSIFIED EXCAVATION, GENERAL. - a. General. - Unclassified excavation, general, shall consist of the satisfactory removal, hauling to project features, hauling to and placement in stockpiles and spoil areas, of materials removed as unclassified excavation from within the lines, grades, and slopes of all project features as shown on the drawings or as modified in the field by the Contracting Officer, except materials excavated from the borrow areas or as otherwise specified in Section 1, PREPARATION OF SITE. Unclassified excavation, general, shall also include the satisfactory removal and hauling to spoil areas of materials excavated in the rock borrow area to the extent directed. All excess and unsuitable materials as defined in Paragraph 3-02, from the required excavations, shall be disposed of in the spoil areas designated on the drawings or defined in this specification except that spoil material shall be placed to a minimum thickness of 5 feet to form the "spoil blanket" upstream from the dike as shown on the drawings. The sequence of operations, to insure the maximum utilization of materials from required excavation, is specified in Paragraph 3-02, above.

b. Stripping. - Stripping shall be performed within the areas shown on the drawings and shall be limited in depth so as to remove only those surficial materials considered to be unsatisfactory for embankment fill material or unsuitable as a foundation material. Stripping operations shall be performed in such a manner as to salvage materials acceptable for processing for topsoil to the extent required as specified in Section 43, "TOPSOILING, SEEDING AND MULCHING". Only natural surface soil containing humus material shall be stockpiled. The Contracting Officer shall guide and control the extent and final depth of stripping and may direct the contractor to strip to the limits and depths different from those shown on the drawings at no change in the contract unit prices.

c. Grading. - Roads, turnarounds, parking and building areas, and other required areas shall be graded in accordance with the sections indicated on the drawings. Shoulders, ditches, side slope, subgrades, and other designated areas shall be trimmed and dressed in a neat and workmanlike manner to the lines and grades shown on the drawings or stakes in the field. The subgrade upon which road gravel will be placed shall be shaped to a uniformly even and regular grade in accordance with lines and grades indicated on the drawings or as determined in the field.

d. Initial Reach for Dam Foundation Cut-Off. - (1) The initial excavation for the foundation cut-off for the dam shall be done within the limits shown on the drawings. The bottom grades as shown on the drawings, or as modified by the Contracting Officer prior to the start of the excavation, shall be used to establish the location of the side slopes. If it is determined during the course of the excavation operations that the excavation must extend below the grades indicated to effect the desired cut-off or to reach the bedrock surface, the excavation slopes below the indicated grades shall be constructed as directed.

(2) The excavation shall be made in the dry. The contractor shall install and maintain an adequate system of wells, well points, or other similar devices and shall lower and maintain the water table in the area of the excavation so that the excavation, grouting, foundation preparation, and placement of fill will be entirely in the dry. Pumping from open areas and sumps within the area of excavation will not be permitted except for the removal of water from depressed rock areas at the final bottom of the excavation. The contractor shall be responsible for producing and maintaining stable earth excavation slopes.

(3) Thirty (30) days prior to the start of the initial excavation, the contractor shall submit plans and data relative to his proposed system or systems and methods so that all work including excavation will be in the dry, and to any proposed construction in the bottom of the excavation to aid in dewatering the foundation surface and shall obtain written approval from the Contracting Officer prior to proceeding with the work. Approval of the dewatering system by the Contracting Officer will not relieve the contractor of responsibility for the adequacy of the system or producing and maintaining the conditions required by this specification nor shall approval be construed as obligating the Government for any damage except as provided for in paragraph in SPECIAL CONDITIONS entitled "Damage to Work".

(4) The entire excavation, grouting, and foundation preparation within the limits of initial work and the placement of compacted impervious fill up to five feet above the elevation of the adjoining stripped ground surface in the river area shall be accomplished prior to the construction of the upstream permanent cofferdam. The responsibility of the contractor relative to flooding shall be as stated in SPECIAL CONDITIONS.

e. Foundation Drains and Final Reach of Dam Foundation Cut-Off. - This subparagraph applies to the excavations for the embankment foundation drains and the reach of the dam foundation cut-off beyond the initial reach as shown on the drawings. The grades of the bottoms of the foundation drains and cut-off as shown on the drawings shall be used to establish the locations of the side slopes for the excavation except as stated herein. The downstream excavation slope between Stations 8 plus 50 and 9 plus 25 for the dam foundation drain and both the upstream and downstream excavation side slopes for the dam foundation cut-off east of the initial excavation limits shall be modified in the field according to the actual elevation of the bedrock surfaces to provide the widths of the bottoms as shown on the drawings. The excavations shall be continuously dewatered during excavation operations, preparation of foundation and the placement of fill materials except that a maximum of 1-foot depth of water will be permitted in the bottom of the excavation for the foundation drains during the placement of the initial layers of fill material. The contractor shall be responsible for producing stable side slopes for all excavations and shall provide such means as may be necessary to maintain their stability. The excavations for the dam shall not be accomplished until the excavated materials can be placed directly into the random fill section of the dam.

f. Service Bridge. - The excavation for the service bridge abutment shall not be made until after the compacted impervious fill of the dam at the location of the abutment has been constructed to an elevation of 3 feet above the bottom of the required excavation. Excavation for the construction of Pier No. 1 shall not be started until the dam embankment has been completed to Elev. 593.

3-05. CLEANING OF BEDROCK SURFACES. - a. General. - The preparation of rock surfaces against which concrete is to be placed is specified elsewhere in this section of the specifications. The excavation at and cleaning of other bedrock surfaces shall be in accordance with the provisions in the following subparagraph. Areas other than those designated shall be cleaned, if directed. All excavation required for the cleaning and preparation of the surfaces shall be paid for at the applicable contract unit prices for "Unclassified Excavation, General", and "Rock Excavation - General". In addition, payment for cleaning shall be made as stated elsewhere in this section.

b. Machine Cleaned. - The following bedrock surfaces shall be "machine cleaned":

(1) Surfaces of bedrock below which the rock is to be excavated for rock slope protection material including rock borrow area.

(2) Surfaces of bedrock within the designated limits of "machine cleaned" areas of the foundation of the embankments as shown on the drawings.

Machine cleaning shall consist of the removal of all earth and loose rock and rock fragments from the entire bedrock surface including areas of depressions, large crevices, and large open joints. The material need not be removed in areas where the horizontal width of the openings are less than 16 inches. The degree of cleaning shall at least be equivalent to that obtainable with a toothless one-quarter yard backhoe dipper after the material has been loosened by prior operations. No rock excavation will be required to remove overhangs or similar obstacles to the cleaning operation.

c. Hand Cleaned. - The following bedrock surfaces shall be "hand cleaned":

(1) Surfaces of areas within the embankment foundation areas as indicated by the drawings.

(2) All surfaces within the limits of an embankment foundation area to be stripped or excavated to bedrock as shown on the drawings except areas designated to be "machine cleaned".

(3) All surfaces exposed by stripping operations between dam foundation cut-off and the upstream limit of the previous zone.

(4) All surfaces within the limits of an embankment foundation produced by rock excavations for concrete structures except areas to be covered with concrete.

Hand cleaning of bedrock surfaces and rock surfaces produced by rock excavations shall consist of the removal of all earth, disintegrated bedrock, semi-detached or detached rock blocks, and rock fragments from the entire bedrock surface including areas of depressions, crevices and joints. The bedrock surface shall be cleaned by washing or sweeping. In addition, all cracks, joints and crevices in the bedrock surfaces shall be cleaned by use of jets of air or water or a combination thereof to the satisfaction of the Contracting Officer immediately prior to the placement of compacted gravel or backfill thereon or in the preparation for the filling of these openings with mortar in areas to be covered with compacted impervious fill as specified in Section 7, "EMBANKMENTS". Hand cleaning in the areas against which impervious materials are to be placed shall be accomplished after the special rock excavation at the surface required to reduce the quantity of hand compacted fill and to eliminate overhangs as specified elsewhere in this section of the specification. Rock excavation will not be required at surfaces of rock upon or against which gravel fill or gravel backfill is to be placed. Initial hand cleaning of rock surfaces produced by rock excavation for concrete structures and to the extent practical, the filling of the cracks with mortar as specified in Section 7, "EMBANKMENTS", shall be accomplished at the same time as the preparation of rock surfaces against which concrete is to be placed.

3-06. UNCLASSIFIED EXCAVATION, BORROW. - a. General. - Unclassified excavation, borrow, shall comprise the satisfactory removal, hauling to the project features, hauling to and placement in stockpiles and spoil areas of materials excavated from the borrow areas and removed as unclassified excavation defined in Paragraph 3-03 of these specifications. Materials shall be excavated from the designated borrow areas to the extent required to obtain suitable impervious fill, pervious fill and gravel bedding materials. The Contracting Officer shall guide and control the stripping, removal of unsatisfactory surface materials, and the selection of materials in the borrow areas to obtain materials with the specified requirements. The contractor shall excavate pits with a backhoe or bulldozer in Borrow Areas C and E as directed by the Contracting Officer to obtain information required for the proper control of the excavation to obtain the desired materials. It is expected that approximately 50 pits will be required. Boulders and oversize stones removed during the excavation shall be disposed of in the spoil areas. All clearing operations shall be as specified in Section 1, "PREPARATION OF SITE", for clearing operations at other locations.

b. Borrow Area B. - (1) Impervious fill material for all embankments and fills shall be obtained from Borrow Area B. This borrow area shall be cleared within limits of 25 feet beyond the limits of the excavation. Clearing for stockpiles and spoil piles outside the designated limits of excavation shall be confined to the actual areas required. The borrow area shall be stripped only within the area of the limits of actual excavation. Stripping shall be extended only to the depth required to remove sod, forest debris, humus material, and material containing small roots, all as directed. The depth of stripping shall not be extended in order to remove occasional or large roots which can be removed during placement of the impervious fill material. The required quantity of approved stripping material containing humus and organic material shall be salvaged and stockpiled as specified in Section 43, "TOPSOILING, SEEDING, AND MULCHING", for use in Borrow Area B, or other project areas to be topsoiled. The portion of excavation slopes existing each fall shall be graded, dressed, topsoiled and seeded.

(2) The impervious fill material shall be excavated in nearly horizontal lifts extending over the entire area to be excavated, as indicated by the upper limit of slope lines as shown on the drawings. Unless otherwise directed, the final excavation slope lines shall be 1 (vertical) on 3 (horizontal) extending downward from the limits shown on the drawings except as specified in subparagraph (4) below. The finished bottom of the excavation shall be uniformly graded to the satisfaction of the Contracting Officer. It shall be approximately horizontal with grades to provide drainage of not steeper than 10 percent. No excavation shall be made beyond the designated final excavation slope lines of 1 on 3. The final excavation slopes shall be trimmed and graded with a bulldozer or similar equipment to provide finished slopes composed entirely of undisturbed natural soil. Filling on the slopes shall be limited to that required to fill erosion areas immediately prior to the placement of topsoil.

(3) Prior to the start of borrow excavations, the contractor shall construct ditches and embankments along the limits of excavation which will prevent surface water from entering into the area of excavation. Additional drainage facilities shall be constructed in the excavation area to channel subsurface and rain water from areas of excavation operations. The final bottom of the excavation areas shall be graded for proper drainage. All operations in connection with drainage including the filling of temporary ditches shall be subject to the approval of the Contracting Officer and, if not considered adequate by the Contracting Officer, additional facilities shall be provided. Permanent interceptor drainage ditches shall be constructed along the top of slopes at locations shown on the drawings and at other locations if

directed. The depths, excavation slopes and exact location of the permanent ditches shall be as directed in the field. Materials from these ditches shall be spoiled between the ditch and the excavation areas unless otherwise directed.

(4) It is expected that bedrock will be encountered in some areas within the designated slopes. In areas where bedrock becomes exposed, the excavation areas shall be extended to the extent practical so that the rock surfaces shall form the excavation limits. All bedrock surfaces exposed shall be cleaned to the extent feasible with bulldozers.

c. Borrow Areas C and E. - (1) Pervious fill and gravel bedding materials shall be obtained from Borrow Area C and if required also from Borrow Area E. The entire area of Borrow Area C shall be cleared. If the contractor elects, the entire area of Borrow Area E may be cleared. In both of these areas, the required materials are covered with a surface deposit of silty sand or sandy silt underlying the topsoil. The thickness of the unsuitable soil and stripping material varies from 1 to 5 feet but probably averages 3 feet for both Borrow Areas. The areal extent to which these unsuitable materials shall be removed shall be limited to that required to obtain the required quantities of suitable materials. The initial removal of unsuitable surficialmaterial shall be limited to 2/3 the area of Borrow Area C. Removal of the unsuitable surficial material from additional portions of Borrow Area C and Borrow Area E shall be accomplished only upon written approval of the Contracting Officer. Care shall be taken in removing the unsuitable surficial materials so as to conserve the underlying sands and sandy gravels. Topsoiling and seeding of the excavated areas or final grading in these borrow areas will not be required. The Contracting Officer reserves the right to revise the limits of Borrow Area C in the field without affecting the contract unit price.

(2) The excavation in Borrow Areas C and E shall be to the full depths of suitable materials except that excavation shall not be required below the level of the bottom of the river adjacent to, or opposite, the portion of the area being excavated. The contractor shall excavate the materials on a face for the full depth of required excavation in a manner that shall mix the materials at all horizons.

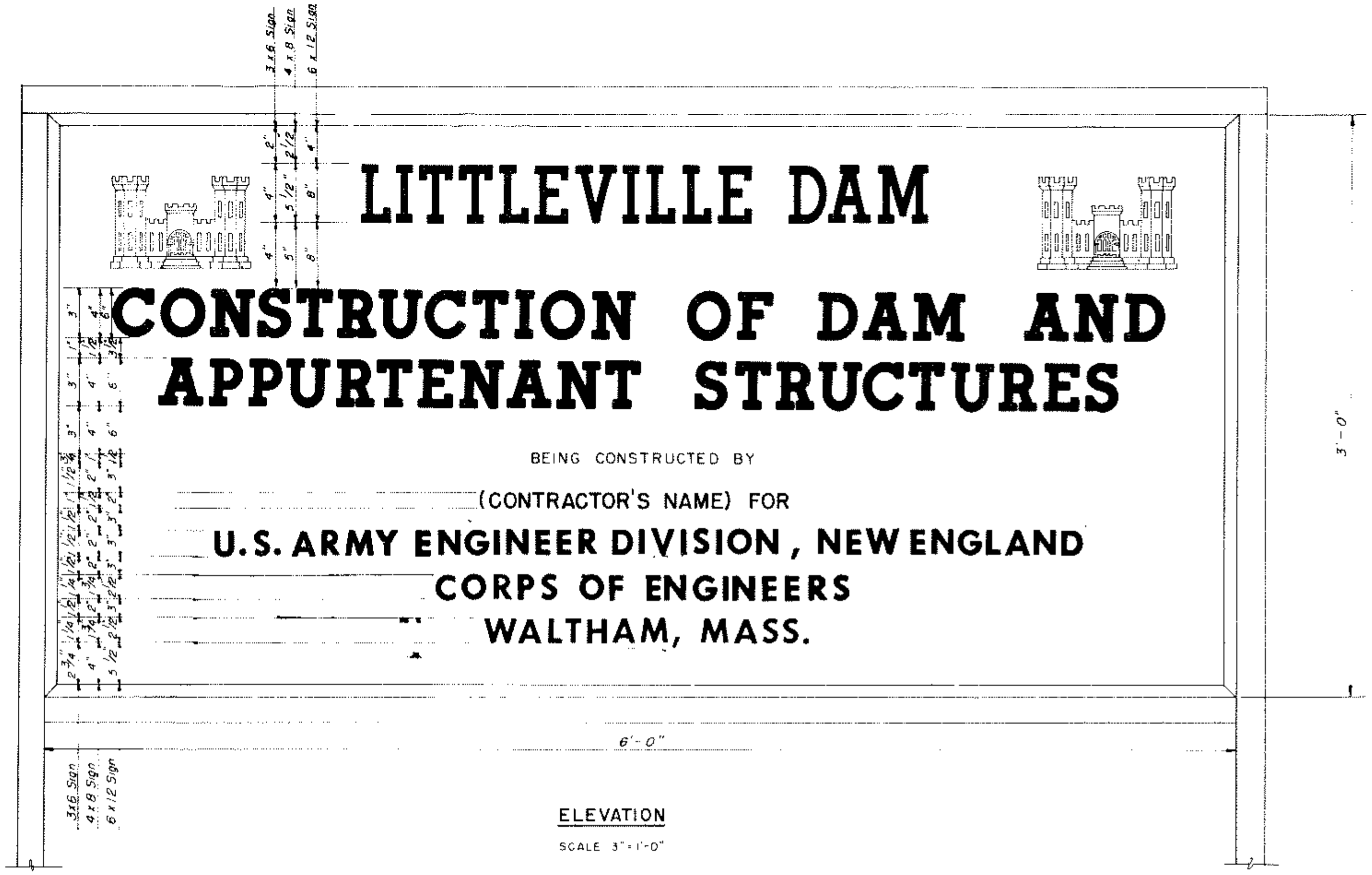
3-07. ROCK EXCAVATION. - a. General. - The contractor shall excavate all rock at the locations of the dam, spillway, water supply outlet works, and approaches for flood control outlet works as required for the permanent works to the slopes, lines and grades shown on the drawings or otherwise directed. Excavation to lines and grades other than those shown on the drawings will be directed in writing. Rock excavation shall include continuous maintenance and scaling of the side slopes. In areas of rock excavation, the rock surface shall be maintained in a cleaned condition after overburden excavation and prior to rock excavation, to prevent contamination of the excavated rock with overburden materials. The placement of concrete structures shall be to the elevations or lines indicated on the drawings, except as otherwise noted. In the event that excavations for any structure should reveal that rock or other material encountered at design grades would provide unsatisfactory foundation, the excavation limits in that area shall be adjusted as necessary to provide an acceptable foundation. Additional excavation and concrete quantities required by such adjustment will be paid for at the existing contract prices for these items. Weathered seams and joints in rock at structure foundations shall be cleaned to sound rock or to contact of the sides or to a depth of not less than 3 feet and the joint or seam then backfilled with concrete prior to placing concrete for the structure.

b. Final Grades and Excavation Lines. - The inherent structural characteristics of the bedrock will require that excavations be carefully made in approach to the grades and lines shown on the drawings. From observations of the breaking characteristics of the rock gained at the outset of the work and as the excavation progresses, the charges used in blasting and the loading and spacing of drilled holes will be revised to prevent overbreak and shattering of rock outside the design slopes or grades. The blasting shall be performed only to the depth, amount, and extent with explosives of such quality and power as will break the rock to the lines and grades shown on the drawings and yet will not fracture the rock, open incipient fractures, enlarge existing fractures, make the excavation unduly large or irregular, or cause other damage outside the prescribed limits of excavation. No hole for blasting shall be drilled more than two-thirds the depth of proposed excavations over 15 feet. Blasting shall be performed in a manner most practicable, so as to obtain maximum production of fragmentation suitable for placement in rock fills. As excavations approach final lines and grades the depth of holes for blasting and the amount of explosives shall be reduced progressively. Whenever, in the opinion of the Contracting Officer, blasting to grade or lines may damage the rock against which concrete is to be placed, excavation within 1 foot of lines and grades shall be done by drilling, chipping, picking, barring, wedging or similar methods in which explosives are not used and which will leave the foundation bed or side walls in a solid and unshattered condition. Where major incipient or open planes of cleavage or jointing are encountered which approximate and are behind the design slip and present a potential slope or slide condition not amenable to bolting, excavation shall be made to these planes as directed by the Contracting Officer at applicable unit prices. The contract price for rock excavation shall include scaling of the side slopes. The sides of all rock cuts will be carefully scaled of all loose and projecting rock as excavation progresses. Rescaling will be required at no additional cost to the Government as often as may be necessary to permit thorough inspection of the rock surface or whenever rock remaining in the side slopes loosens to the extent that it becomes a potential safety hazard.

c. Blasting. - Any damage by blasting done to the work or to properties beyond the limits of the work shall be repaired or otherwise satisfactorily cared for by the contractor at his expense. The contractor or his surety shall make investigations or prior inspection of structures near the areas of blasting and shall provide such vibration monitoring during the blasting operations as may be necessary to assure conformance with regulatory statutes or directives established by state or other authorities to limit the amount of vibrations generated by blasting. Such investigations shall be conducted by a qualified vibration engineer and copies of the results of investigations including seismograph records shall be furnished the Contracting Officer. The contractor will be required to submit a plan of operations showing the proposed size, spacing, depths and loading of all holes and to obtain the approval of the Contracting Officer before such work is started. When, in the opinion of the Contracting Officer, damage is being done to the rock outside the prescribed limits of excavation, the contractor will be required to revise his drilling and blasting procedure to obtain sound slopes and grade lines and such revisions, if necessary, shall include the drilling of closely spaced holes at no additional cost to the Government. Particular care will be exercised in excavations for the water supply outlet works, in approaches to and for portals of the flood control tunnel, and in excavations for bridge seats and slopes below. Blasting within 100 feet of concrete which has been in place less than seven (7) days will not be permitted under any circumstances, and blasting in the vicinity of concrete older than seven (7) days will be permitted only if approved by the Contracting Officer. Approval of the methods of blasting or the strength and amount of explosives used will not relieve the contractor of his responsibility in connection with damages resulting from blasting operations. All operations involving the transportation, storage, and use of explosives shall be conducted in accordance with applicable laws and the Corps of Engineers handbook "General Safety Requirements" and as specified in Part II, SPECIAL CONDITIONS. The contractor shall provide and keep on the project at all times a radio frequency ammeter or in lieu thereof, a pilot lamp which lights up brightly at 0.06 ampere as recommended in the Institute of Makers of Explosives Pamphlet No. 20 dated 1956, entitled, "Radio Frequency Energy a Potential Hazard in the Use and Transportation of Electric Blasting Caps". Tests shall be made before loading every round. The contractor shall be liable for all injuries or deaths of persons and all property damage caused by blasting or explosives.

d. Benches. - Whenever a bench or other horizontal surface superimposes a vertical or sloped face, the excavation of the horizontal surface shall be completed before the vertical or sloped surface is begun in order to prevent loss of or damage to the vertical or sloped face. Blasting for the bench excavation shall be carefully controlled to prevent damage to that rock which will subsequently form the vertical or sloped face.

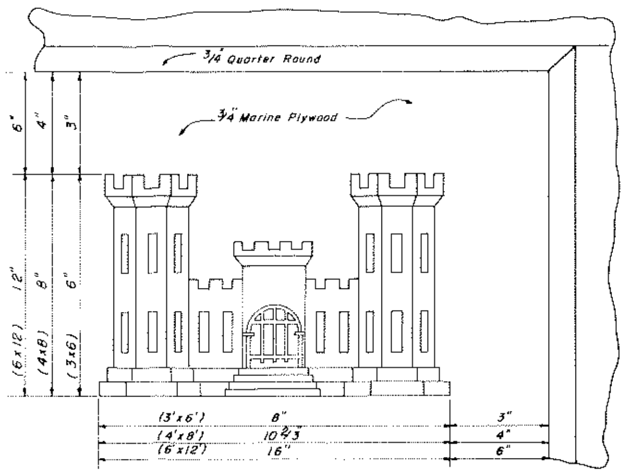
e. Definition of Lines. - (1) Rock excavation on which concrete structures are to be placed shall be to the following lines. The "A" line



ELEVATION

SCALE 3" = 1'-0"

NOTE:
This elevation is of a 3' x 6' sign
See specifications for size required
under this contract



DETAIL OF CASTLE

SCALE 6" = 1'-0"

SPECIFICATIONS

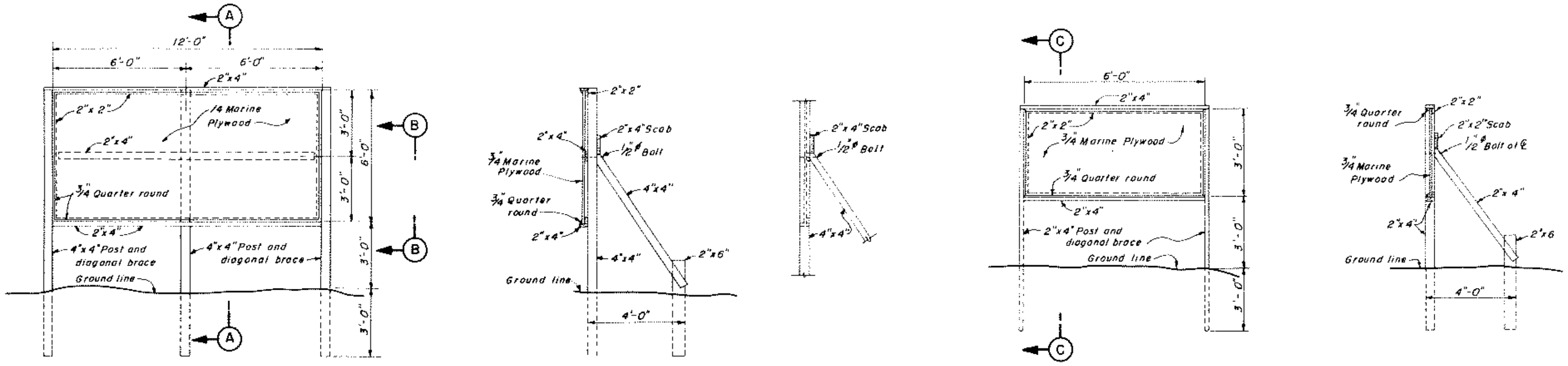
1 Posts, rails and bracing shall be No.1 yellow pine or approved equal S4S-Fed. Spec. MM-L-751c.

2. All exposed surfaces shall be given one coat of linseed oil and wiped prior to primer coat.

3. All exposed surfaces shall be given one coat of exterior lead and oil primer-Fed. Spec. TT-P-25a and two finish coats of white exterior oil paint-Fed. Spec. TT-P-104.

4 Black lettering and red Engineer Castles shall be Kem Bulletin Colors C20 B1 and C20 R7 respectively as manufactured by Sherwin-Williams Co., or approved equal.

5. Marine Plywood shall conform to Commercial Standard CS-45, exterior type, Grade A-C.



ELEVATION SECTION A-A SECTION B-B

6' x 12' SIGN

ELEVATION SECTION C-C

3' x 6' SIGN
AND
4' x 8' SIGN

CONSTRUCTION SIGNS

SCALE 3/8" = 1'-0"

CONSTRUCTION SIGN

DRAWING NUMBER

CT-1-5818

Serial No. CIVENG-19-016-62-49

CONNECTICUT RIVER FLOOD CONTROL PROJECT

SPECIFICATIONS

FOR

CONSTRUCTION

OF

LITTLEVILLE DAM

AND

APPURTENANT STRUCTURES

MIDDLE BRANCH, WESTFIELD RIVER

MASSACHUSETTS

VOLUME II OF III

Technical Provisions
(Sections 15 - 31)

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND

CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS

TABLE OF CONTENTS

VOLUME I OF III

INVITATION FOR BIDS

BID FORM

PART I - GENERAL CONDITIONS

PART II - SPECIAL CONDITIONS

PART III - TECHNICAL PROVISIONS

Section No.	Title
1	PREPARATION OF SITE
2	CONTROL OF DIVERSION OF WATER
3	EXCAVATION - OPEN CUT
4	EXCAVATION - TUNNEL AND SHAFT - ITEMS 7 & 8
5	ROCK BOLTING
6	TUNNEL RIB SUPPORTS
7	EMBANKMENTS
8	ROCK SLOPE PROTECTION, SELECTED RIPRAP AND GRAVEL BEDDING
9	MISCELLANEOUS FILLS, ROADS, DRIVES, AND PARKING AREAS
10	CULVERT
11	FOUNDATION DRILLING AND GROUTING
12	TUNNEL GROUTING
13	ANCHOR BARS
14	CONCRETE

VOLUME II OF III

Section No.	Title
15	48-INCH WATER SUPPLY PIPE
16	WATER SUPPLY INTAKE TOWER AND FLOOD CONTROL GATE SHAFT - MISCELLANEOUS
17	FLOAT WELL AND AIR VENT
18	SLUICE GATES, VALVES AND ACCESSORIES
19	OMITTED
20	OMITTED
21	OMITTED
22	TRAVELING CRANES
23	DIESEL ENGINE-GENERATOR SET
24	VENTILATING SYSTEM, MECHANICAL
25	ELECTRICAL WORK; INTERIOR
26	HEATING SYSTEMS, FORCED-WARM-AIR: OIL-FIRED FURNACE
27	ELECTRICAL-EXTERIOR
28	STRUCTURAL STEEL BRIDGES
29	MISCELLANEOUS METAL ITEMS
30	METALS, MISCELLANEOUS MATERIALS AND STANDARD ARTICLES
31	METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS

VOLUME III OF III

Section No.	Title
32	TRENCH EXCAVATION AND BACKFILLING FOR UTILITIES, DRAINS AND CULVERTS
33	MISCELLANEOUS ITEMS OF WORK
34	UTILITY BUILDING, OPERATORS' QUARTERS AND GARAGE
35	PLUMBING, GENERAL-PURPOSE
36	HEATING SYSTEM; FORCED-HOT-WATER, OIL-FIRED
37	WATER SUPPLY WELLS
38	WATER AND SEWER SYSTEMS
39	OMITTED
40	PAINTING
41	BITUMINOUS CONCRETE PAVEMENT
42	BITUMINOUS SURFACE TREATMENT
43	TOPSOILING, SEEDING AND MULCHING

SECTION 15

48-INCH WATER SUPPLY PIPE
(Item 65)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
15-01	Scope	15-1
15-02	Applicable Publications	15-1
	a. Federal Specification	15-1
	b. American Society for Testing Materials Standards	15-1
	c. Corps of Engineers	15-1
	d. American Water Works Association	15-1
	e. American Standards Association Standard	15-1
15-03	General	15-1
	a. Strength Requirements	15-2
	b. Responsibility and Certification	15-2
15-04	Materials	15-2
	a. Concrete	15-2
	b. Reinforcement	15-2
	c. Rubber Gasket	15-3
15-05	Installation	15-3
	a. General	15-3
	b. Jointing	15-3
	c. Concrete	15-3
15-06	Anchors	15-3
15-07	Cast Iron Pipe and Fittings	15-3
15-08	Tests	15-4
15-09	Payment	15-4

SECTION 15

48-INCH WATER SUPPLY PIPE
(Item 65)

15-01. SCOPE. - This section covers construction of the 48-inch water supply pipe, complete, including pipe supports and appurtenances.

15-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

a. Federal Specification:

SS-C-192d	Cement, Portland.

b. American Society for Testing Materials Standards:

C-231-56T	Air Content of Freshly Mixed Concrete by the Pressure Method.
C-33-59	Concrete Aggregates.

c. Corps of Engineers:

CRE-C13-55	Evaluation of Air-Entraining Admixtures for Concrete.

d. American Water Works Association:

C-100-52	Cast Iron Pressure Fittings.
C-301-58	Reinforced Concrete Water Pipe, Steel Cylinder Type, Prestressed.

e. American Standards Association Standard:

A21.2-1953	Cast Iron Pit Cast Pipe for Water or Other Liquids.

15-03. GENERAL. - Concrete pipe shall conform to the applicable requirements of AWWA C301-58, except as modified hereinafter. The pipe joint shall be sealed by a rubber gasket. Each length of pipe shall be provided with bell and spigot ends formed by steel joint rings securely welded to the cylinder. The spigot ring shall be lined with concrete on its exterior surface. Portions of the joint rings which will be exposed after the pipe is manufactured shall be protected from corrosion by a metallic coating or equivalent.

applied by an approved method. The spigot ring shall have a groove for the purpose of receiving, holding and protecting the gasket. The steel for bell rings shall be 1/4 inch or more in thickness and shall conform to Grade A or B, ASTM Specification A-283. The steel for the spigot ends shall conform to Grade A, ASTM Specification A-31. The joint shall conform in all essential details with the rubber and steel joint for concrete pressure pipe as manufactured by Lock Joint Pipe Company under their Specification SP5-56.

a. Strength Requirements. - Pipe shall be designed to withstand an internal pressure of not less than 135 pounds per square inch. Two lengths of pipe selected at random, shall be tested to show the pipe will withstand the design internal pressure.

b. Responsibility and Certification. - All tests performed on the pipe shall be observed by a representative of the Contracting Officer. The Government reserves the right to observe and inspect all phases of the manufacture and testing of the pipe. The contractor shall be responsible for having the materials, concrete and pipe he proposes to furnish tested to demonstrate conformance to the applicable specifications. Certified copies of the test reports shall be delivered to the Contracting Officer before the pipe is installed.

15-04. MATERIALS. - The following materials shall conform to the respective specifications and the requirements specified below:

a. Concrete. - Concrete shall be composed of portland cement, fine and coarse aggregate, water and an air-entraining admixture.

(1) Portland Cement shall conform to Federal Specification SS-C-192d, Type II.

(2) Processed Aggregates. - Aggregates shall conform to ASTM Standard C33 except the grading requirements shall not apply.

(3) Air-Entraining Admixture. - The air-entraining-admixture shall be any approved substance or compound which will produce entrained air in the concrete. The air-entraining admixture shall conform to Corps of Engineers Serial No. CRD-C13 and will be accepted on manufacturer's certification of compliance. The air content by volume shall be 5.0 percent plus or minus 1.0 percent as determined by ASTM Standard C231.

(4) Water. - Water used in mixing and curing concrete shall be fresh, clean and suitable for use as drinking water.

b. Reinforcement. - Reinforcement steel shall be in accordance with AWWA Specification C301-58.

c. Rubber Gasket. - The gasket sealing the joint shall be made of rubber of special composition, having a texture to assure a water-tight and permanent seal and shall be the product of a manufacturer having at least five years experience in the manufacture of rubber gaskets for pipe joints. The gasket shall be a continuous ring, of suitable cross section and of such size as to fill the groove on the spigot joint ring when the pipes are laid. The rubber gasket shall be the sole element depended upon to make the joint watertight and shall have smooth surfaces free from pitting, blisters, porosity and other imperfections.

15-05. INSTALLATION. - a. General. - The concrete pipe shall be supported on chairs or other suitable means to substantially and uniformly support the pipe to the correct line and grade as recommended by the pipe manufacturer. The supports shall be adequate to hold the pipe at the correct line and grade during placement of concrete specified in subparagraph c. below. The pipe shall be anchored to prevent movement during placement of concrete. All pipe laying shall proceed from the intake with the tongue ends of tongue-and-groove pipe pointing upstream. Each pipe shall be laid true to line and grade and in such manner as to form a close joint with the adjoining pipe. As the work progresses, the interior of the pipe shall be cleared of all dirt and superfluous materials of every description.

b. Jointing. - The pipe shall be jointed in accordance with the manufacturer's recommendations. In making the joints on the interior of the pipe, special care shall be taken to assure a smooth surface with no projections or depressions.

c. Concrete. - After pipe has been inspected and approved by the Contracting Officer, concrete shall be placed and compacted around the pipe as specified under Section 14, CONCRETE.

15-06. ANCHORS. - Anchors shall be provided at the quarter points of each length of pipe in accordance with the details shown on the drawing. Bolts, washers and strap shall be bronze. Material shall conform to applicable requirements of Sections 30 and 31.

15-07. CAST IRON PIPE AND FITTINGS. - The cast iron pipe, tee, wall sleeve, bulkheads and adaptors shall conform to the applicable sections of AWWA Specification C-100. Bulkheads shall be provided at each end of the pipe for testing but the upstream one shall remain permanently. Flanges shall be 125 pound American Standard. Adaptors pipe and tee shall be Class C. The wall sleeve shall be Class D. After assembly the bolts shall be completely coated with a bitumastic paint. All cast iron pipe and fittings shall be suitably supported on concrete blocks.

49

15-08. TESTS. - Upon completion of the water line and before the diversion conduit is completed. The entire water line shall be tested under a hydrostatic head of 160 feet under the supervision of the City of Springfield Water Department. The contractor shall make all necessary arrangements with the Water Department when the water line is ready for testing and shall inform the Contracting Officer of all arrangements made. The contractor shall provide a downstream bulkhead and the necessary bracing to withstand the static thrust. In addition the contractor shall be required to furnish any temporary blocking on the sides and/or top of the pipe to resist any movement which might otherwise occur. River water is acceptable for testing purposes. The pipe shall be pressurized and held at the maximum pressure for three hours after the contractor has repaired all leaks.

15-09. PAYMENT. - Payment for all work specified in this section, except for concrete placed around the pipe, will be made at the contract lump sum price for Item No. 65, "48-Inch Water Supply Pipe". Concrete placed around pipe will be measured and paid for under Item No. 56.

SECTION 16

WATER SUPPLY INTAKE TOWER AND FLOOD CONTROL GATE SHAFT - MISCELLANEOUS

(Items 68 and 69)

Paragraph No.	Paragraph Title	Page No.
16-01	Scope	16-1
16-02	Drawings for Approval	16-1
16-03	Concrete	16-1
16-04	Miscellaneous Metals	16-1
16-05	Flue Linings and Thimbles	16-1
	a. Materials	16-1
	b. Installations	16-1
16-06	Masonry Work	16-2
	a. Materials	16-2
	b. Handling and Storage	16-3
	c. Samples	16-3
	d. Certificates	16-3
	e. Tests for Drying Shrinkage	16-3
	f. Test for Air-Dry Condition	16-4
	g. Test for Mortar	16-4
	h. Erection	16-4
	i. Pointing and Cleaning	16-6
16-07	Roofing	16-6
	a. General	16-6
	b. Materials	16-6
	c. Application of Roofing	16-7
16-08	Calking	16-8
	a. Materials	16-8
	b. Application	16-8
16-09	Aluminum Windows	16-8
	a. Samples	16-8
	b. General Requirements	16-9
	c. Windows	16-9
	d. Insect Screens	16-10

Paragraph No.	Paragraph Title	Page No.
	e. Glass	16-11
	f. Glazing	16-11
	g. Installation	16-11
	h. Protection	16-11
	i. Cleaning	16-12
16-10	Aluminum Letters	16-12
	a. General	16-12
	b. Castings	16-12
	c. Lettering	16-12
16-11	Flashing	16-12
	a. Copper Flashing	16-12
	b. Soldering	16-12
	c. Seams	16-12
	d. Expansion Joints	16-13
	e. Cap Flashings	16-13
	f. Reglets	16-13
16-12	Exterior Hollow Metal Doors	16-13
	a. General	16-13
	b. Material	16-13
	c. Painting	16-14
	d. Hardware	16-14
	e. Frames	16-14
16-13	Interior Hollow Metal Doors	16-15
	a. Materials	16-15
	b. Doors	16-15
	c. Hardware, (Per set swing door)	16-15
	d. Filter Chamber Access Door	16-15
	e. Air-Tight Swing Doors	16-15
16-14	Carpentry	16-15
	a. Kitchen Cabinets	16-15
	b. Shelving	16-15
	c. Framing	16-16
	d. Finish	16-16
	e. Plywood Doors	16-16
	f. Folding Door	16-16
16-15	Government-Furnished Items - Gate Shaft Structures	16-16

Paragraph No.	Paragraph Title	Page No.
16-16	Fire Extinguisher	16-16
16-17	Louvers	16-16
	a. Fixed Louvers	16-16
	b. Screens	16-17
	c. Motorized Louvers	16-17
	d. Damper Motor	16-17
	e. Ductwork	16-17
	f. Filter	16-17
16-18	Scuppers	16-17
16-19	Cant Strips	16-18
16-20	Bronze Plaques	16-18
16-21	Roof Hatchways	16-18
16-22	Bronze Plugs	16-18
16-23	Payment	16-18
	a. Payment	16-18
	b. Other Items	16-18

SECTION 16

WATER SUPPLY INTAKE TOWER AND FLOOD CONTROL GATE SHAFT - MISCELLANEOUS
(Items 68 and 69)

16-01. SCOPE. - The work covered by this section of the specifications consists in furnishing all labor, plant, equipment, materials and appliances, and performing all operations in connection with the construction of the intake tower and gate shaft superstructures and necessary appurtenances thereto, except furnishing and installing of equipment and accessories specifically included under other payment items, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

16-02. DRAWINGS FOR APPROVAL. - Before fabricating or furnishing any of the items listed below and all other shop fabricated metal items, detail shop drawings supplemented with descriptive data shall be submitted for approval. Samples shall be submitted if specified elsewhere in this section.

(1) Windows.

(2) Metal doors and frames - showing details of shop work, assembly moulding, and hardware.

(3) Scupper lining and reglets.

(4) Aluminum letters.

16-03. CONCRETE. - All concrete work shall be in accordance with Section 14, CONCRETE. In addition, the thresholds (concrete sills) shall contain abrasive aggregate of aluminum oxide or emery graded from particles retained on a No. 50 sieve to particles passing a No. 8 sieve, using 1/4 pound of abrasive aggregate for each square foot of surface.

16-04. MISCELLANEOUS METALS. - All structural steel, miscellaneous metals and workmanship shall be in accordance with Sections 29, 30, and 31 of these specifications. Shop drawings shall be submitted for all shop fabricated metal items.

16-05. FLUE LININGS AND THIMBLES. - a. Materials. - Flue linings shall be terra cotta free from blisters and warping, standard sizes, and of sound manufacture. Thimbles shall be provided as directed by the Contracting Officer.

b. Installation. - Chimneys shall be built of concrete, lined with terra cotta flue lining of the size shown on the drawings, and extending from one foot below the smoke inlet, the full height of the flue and a distance of not less than two inches above the chimney. A suitable cast-iron cleancut door and frame and thimble shall be placed for each chimney. Mortar for joints of flue lining shall be made with refractory cement low temperature grade, and struck smooth inside. Linings shall be built in as the work progresses.

16-06. MASONRY WORK. - Concrete blocks shall be installed where indicated.

a. Materials. - (1) Aggregate used in making concrete masonry units shall conform to ASTM Standard C33-59 or C331-59T except as modified hereinafter. Grading of aggregates as stipulated in Section 7 in ASTM Standard C33-59 and testing of lightweight aggregates for drying shrinkage as stipulated in Section 6(a) in ASTM Standard C331-59T will not be required. Lightweight aggregates shall comply with the following requirements when tested for stain-producing iron compounds.

(a) When determined by visual classification method, the iron stain deposited on the filter paper shall not exceed the "light-stain" classification.

(b) When determined by chemical analysis method and reported Fe_2O_3, the iron stain deposited on the filter paper from a 200 gram sample shall not exceed 1.2 mg. Fe_2O_3.

(2) Anchors and Ties. - Anchors and ties shall be of approved design and shall be zinc-coated ferrous metal of the types indicated on the drawings or approved. Zinc coating of anchors and ties shall conform to ASTM Standard A 153-60, Class B-1, B-2, or B-3, as required. Anchors for dovetail slots shall be 1-inch flat anchors not less than 0.0598-inch in thickness.

(3) Cement shall conform to Federal Specification SS-C-192d.

(4) Concrete masonry units shall be of modular dimensions and shall include all closers, jamb units, and special shapes and sizes required to complete the work as indicated. Units shall be of the same appearance and shall be cured by the same process. Units shall be sound and free from cracks, chipped edges, or other defects that would interfere with their proper setting or impair the strength, appearance, or durability of the structures. Units shall be free of any deleterious matter that will corrode metal. Concrete masonry units that have been subjected during manufacture to a saturated-steam pressure of not less than 120 pounds per square inch for 5 hours or more may be used as soon as cooled. Units that have not been subjected to such steam pressure shall be cured for 28 days or more before delivery. Units shall be delivered to the job site in an air-dry condition, and shall have a linear shrinkage potential not in excess of 0.065 percent as determined by ASTM Standard C426-58T.

(a) Concrete masonry units conforming to ASTM Standard C 129-59, shall be used for all masonry work.

(5) Mortar shall comply with the property specification for type N mortar as set forth in ASTM Standard C 270-59T, except that when tested for water retention, the mortar shall have a flow, after suction of 75 percent or more when mixed to an initial flow of 125 to 140 percent. When tested for compressive strength, the water-retention requirements for mortar stipulated in ASTM Standard C 270-59T shall apply. When used in the work, mortar shall be mixed in the laboratory-established proportions with as much water as may be necessary to produce the workability desired regardless of initial flow. The contractor shall furnish a certified copy of laboratory established proportions and tests as evidence that the mortar used in the work meets the requirements of the property specification as modified herein. No change in the laboratory-established proportions shall be made nor shall materials with different physical or chemical characteristics be utilized in mortar used in the work unless the contractor furnishes additional evidence that such mortar meets the requirements of the property specification as specified herein.

b. Handling and Storage. - Masonry materials shall be stored in an approved manner that will protect them from contact with soil and exposure to the elements.

c. Samples. - The following samples of materials proposed for use shall be submitted to the Contracting Officer and his approval thereof received before materials represented by the samples are delivered to the project site. Representative samples shall be taken periodically from on-the-site stockpiles as required by the Contracting Officer for testing.

(1) Concrete Masonry Units. - All shapes, sizes, and kinds in sufficient numbers to show full range of color and texture.

d. Certificates. - The contractor shall furnish certificates, executed in quintuplicate prior to delivery of the certified material to the project site. Each certificate shall be signed by an authorized officer of the manufacturing company and shall contain the name and address of the contractor, the project location, and the quantity and date or dates of shipments or delivery of the material to which the certificate applies. Concrete masonry units shall be certified for compliance with all specification requirements. Aggregates for concrete masonry units shall be certified for compliance with specification requirements for nonstaining and popout properties.

e. Tests for Drying Shrinkage. - Sampling and testing to determine the linear shrinkage potential of concrete masonry units, shall be done by an approved commercial testing laboratory not more than 3 months nor less than 2 weeks before delivery of units to the project site, and at the expense of the contractor. Three copies of such tests shall be signed by the testing laboratory and countersigned by the contractor and shall be submitted to the Contracting Officer at least 10 days before delivery of units to the project site. No change in manufacturing processes and techniques or in drying and curing procedures shall be made nor shall materials with different physical or chemical characteristics be used in units delivered to the project site unless the contractor verifies the linear shrinkage potential by additional signed test reports.

(1) Samples for Testing. - A sample of 5 individual and whole units representative of the manufacturer's product whose units are proposed for use shall be selected after cooling and/or curing at the point of manufacture. Sample units shall prove under test to be free from cracks or other structural defects, and to have been manufactured with the same type and quality of aggregate, and cured and dried by the same procedures as those to be employed in producing units for use in the work. Units previously subjected to tests involving temperatures exceeding 150 degrees F. shall not be used in drying-shrinkage tests.

(2) Testing shall be done in accordance with ASTM Standard C 426-58T.

f. Test for Air-Dry Condition. - Upon delivery of concrete masonry units to the project site, representative samples shall be selected from stockpiles and tested for air-dry condition. Sampling and testing will be by and at the expense of the Government and will be in accordance with ASTM Standard C 427-58T. Air-dry condition is defined as the moisture condition of a concrete masonry unit in a state of equilibrium with a relative humidity of not greater than 15 percent higher than the average relative humidity at the project site, except that the relative humidity of the unit at equilibrium shall not exceed 85 percent and shall not be required to be less than 50 percent in group I units nor less than 70 percent in group II units. The average relative humidity at the project site shall be as determined by the nearest U. S. Weather Bureau station from the total of annual observations recorded for the month in which the unit is delivered.

g. Test for Mortar. - Test for mortar and to establish the proportions of the mortar to be used on the work shall be done by an approved commercial testing laboratory at the expense of the contractor.

h. Erection. - (1) General. - Masonry shall not be erected when the ambient temperature is below 35 degrees F., except by written permission of the Contracting Officer. No frozen work shall be built upon. No unit having a film of water or frost on its surface shall be laid in the walls. Masonry shall be protected from freezing for 48 hours after being laid. Masonry shall be laid plumb, true to line, with level courses accurately spaced with a story pole, and with each course breaking joints with the course next below. Each unit shall be adjusted to its final position in the wall while mortar is still soft and plastic. Any unit that is undisturbed after mortar has stiffened shall be removed and relaid with fresh mortar. Bond pattern shall be kept plumb throughout. Corners and reveals shall be plumb and true. Chases and raked-out joints shall be kept free from mortar or other debris. Spaces around metal door frames and other built in items shall be solidly filled with mortar. Anchors, wall plugs, accessories, and other items required to be built in with masonry shall be built in as the masonry work progresses. Walls abutting concrete walls shall be anchored thereto with anchors or ties spaced not more than 16 inches on centers vertically. Cutting and fitting of masonry required to accommodate the work of others shall be done by masonry mechanics with masonry saws.

(2) Joints shall be tooled slightly concave with a device of as long length as practicable and so that the mortar will be thoroughly compacted and pressed against the edges of the units. Tooling shall not be done until after the mortar has taken its initial set.

(3) Unfinished work shall be stepped back for joining with new work. Toothing may be resorted to only when specifically approved. All loose mortar shall be removed and the exposed joint shall be thoroughly cleaned before laying new work. Surfaces of masonry not being worked on shall be properly protected at all times during construction.

(4) Mortar that has stiffened because of chemical reaction due to hydration shall not be used. Except as specified below, mortar shall be used and placed in final position within 2-1/2 hours after mixing where air temperature is 80 degrees F. or higher, and within 3-1/2-hours after mixing where air temperature is less than 80 degrees F. Mortar not used within these time intervals shall be discarded. When cement or cements used in the mortar have been tested and the observed time of initial set as determined under ASTM Standard C 266-51T has been ascertained, the time interval during which the mortar must be placed in final position may be determined by an optional method as follows:

Air Temperature in Degrees F.	Time Interval After Mixing
80 or higher	Time of initial set minus 1 hour
Less than 80	Time of initial set minus 1/2 hour

Mortars that have stiffened within the time interval as determined above, because of evaporation of moisture from the mortar, may be retempered by adding water as frequently as needed to restore workability.

(5) Concrete masonry units shall not be wetted before laying. Cutting of units shall be accomplished by masonry mechanics using masonry saws. Concrete units shall be dry cut. Units shall be

set with vertical joints breaking not less than 4 inches over units in the course next below. Mortar joints shall be approximately 3/8 inch wide. Joints shall have full mortar coverage on horizontal and vertical face shells, but mortar shall not extend through the unit on the web edges. Each course shall be bonded at corners.

Jamb units shall be of the shapes and sizes required to bond with wall units. No cells shall be left open in face surfaces.

(a) Partitions shall be continuous from floor to underside of floor construction above.

(b) Lintels in masonry walls shall be constructed using pre-cast concrete lintels. Lintels shall extend at least 8 inches beyond each side of the opening.

i. Pointing and Cleaning. - Before completion of the work, all defects in joints of exposed masonry surfaces shall be raked out as necessary, filled with mortar, and retooled. All masonry surfaces shall be left clean, free of mortar daubs, and with tight mortar joints throughout.

16-07. ROOFING. - a. General. - Roofing shall not start until roof surfaces are smooth, firm, dry, free from dirt and foreign materials, and have been inspected and approved. Vents and other projections through roof shall be properly flashed and secured in position.

b. Materials. - (1) Coal-tar pitch for built-up roofing shall conform to requirements of Federal Specification R-P-381, Type I.

(2) Felt shall be the coal-tar saturated type and shall conform to the requirements of Federal Specification HH-F-201, Type I, No. 15.

(3) Plastic bituminous cement shall conform to the requirements of Federal Specification SS-C-153, Type II.

(4) Surfacing Materials. - Surfacing materials shall consist of screened and washed gravel. Aggregates shall be hard, dry, opaque, and free from elongated, flat and sharp-edged particles, dirt, clay, loam, adherent coatings and any other material or foreign substances that would affect performance and bond or cause deterioration or staining of any metal with which they would come in contact. Grading of the aggregate at time of application shall conform to the following requirements:

Sieve Size (U.S. Standard)	Percent Passing by Weight
3/4-inch	100
5/8-inch	95-100
1/4-inch	0-50
No. 6	0-5

In addition, not more than 0.5 percent, by weight, of the total sample tested, shall pass a No. 200 sieve when tested in accordance with ASTM Method C 117.

c. Application of Roofing. - (1) General. - Coal-tar pitch shall not be heated above 400° F. Rolls of felt shall be stacked in properly protected piles and maintained at a temperature of at least 50° F., for not less than 24 hours prior to laying. Felt and surfacing material shall be dry when applied, and in addition the surfacing material shall be heated in cold weather. Coal-tar pitch shall be hot when applied, and layers of felt shall be laid immediately behind the mop and shall be free of wrinkles or buckles. As each course of felt is mopped into hot bitumen, the top edge of felts shall be carefully broomed-in with an 18- or 20-inch wide soft-fiber-type floor broom to obtain complete adhesion between plies and to close out any air pockets. It is not permissible to mop half the width of sheet and turn back the other half and mop under that portion. Workmen shall not walk on mopped surfaces when the bitumen is in a sticky condition. Each layer of roofing felt shall be carried up abutting vertical surfaces at least 4 inches.

(a) Lapping Felts. - Felts shall be laid with not less than the following laps:

Table I. - Laps for Roofing Felts

Layers or Plies	Laps in inches for 36-inch felt	Starting widths in inches for 36-inch felt
5	29	8, 15, 22, 29, and 36

Vertical laps of roofing felts shall be 6 inches.

(b) Gravel-surfaces, tar, built-up 5-ply roofing on concrete surfaces. - The built-up roofing shall consist of not less than the following quantities in pounds, for each 100 square feet of roof surfaces:

5 layers of coal-tar saturated rag felt	75
Coal-tar pitch	225
Roofing Gravel	400

The concrete surfaces shall be given a uniform coating of hot coal-tar pitch, using not less than 50 pounds on concrete, per 100 square feet. Five layers of coal-tar saturated felt shall be rolled-in immediately after the hot mopping, over the entire roof surface, and lapped in accordance with Table I. Each sheet of coal-tar-saturated felt shall be mopped-in the full width of the lap with hot coal-tar pitch, using not less than 25 pounds per 100 square feet for each mopping.

16-08. CALKING. - a. Materials. - (1) Calking compound shall conform to Federal Specification TT-C-598, grade 1, and shall be delivered to the building site in the manufacturer's original sealed packages. Color shall match the color of the mortar joints.

(2) Sealer. - The sealer for the joint grooves in masonry shall be quick-drying liquid, and of a type and consistency recommended by the manufacturer of the calking compound.

(3) Rope Yarn. - Rope yarn shall be the raveled strands of hemp or jute rope fiber free from oil or other staining element.

b. Application. - Calking shall be installed in joints around metal frames built into concrete exterior walls, and in any other joints so indicated on the drawings and as specified under other sections of these specifications. Calking compound shall be applied by the gun method using nozzles of proper sizes to fit the several widths of the joints. The type of gun shall be subject to approval.

(1) Calking in joints shall be a minimum of 3/4 inch in depth and 1/4 inch in width unless otherwise indicated on the drawings. Where adequate grooves for calking have not been provided, grooves shall be prepared by cutting and cleaning out the concrete to the minimum depth and width, taking care that adjoining metal work is not reduced in section. All particles of mortar, dust, and other foreign matter shall be brushed out and, just prior to calking, the joint grooves shall be coated with an application of sealer. Where a suitable mortar backstop has not been provided, the back of joint grooves shall be tightly packed with rope yarn.

(2) The compound shall be driven into the joint grooves with sufficient pressure to force out all air and to solidly fill the joint grooves. Calking, where exposed, shall be free of wrinkles, and shall be uniformly smooth. Calking around all openings shall include the entire perimeter of each opening. Upon completion of calking, any calked joints not entirely filled shall be roughened and filled as specified and the exposed surface tooled smooth.

(3) The surfaces of all materials adjoining calked joints shall be cleaned of any smears of compound or other soiling due to the calking application. The finished surface shall be primed with aluminum paint and finish painted to match adjacent surfaces.

16-09. ALUMINUM WINDOWS. - a. Samples. - One complete, full-size sample window of each type proposed for use shall be submitted for approval. Sample units shall be taken from manufacturer's stock. Samples shall be complete with hardware, anchors, screens, and other accessories, and shall be finished as specified. Additional samples of hardware items shall be submitted as requested. After approval, samples may be installed in the work provided each sample is clearly identified and its location recorded. Except for varying sizes, windows furnished shall match approved samples.

b. General Requirements. - (1) Conformance to industry specifications. - The contractor shall furnish a certificate from the window manufacturer certifying that the windows conform to the requirements of the applicable industry specifications. However, such certification shall not relieve the contractor from the responsibility to conform to the additional requirements of these specifications. The requirements herein shall govern where there is a difference between these specifications and the referenced industry specifications.

(2) Air Infiltration. - The air infiltration shall not exceed 1 cubic foot per minute per foot of crack length with a wind velocity of 25 miles per hour when tested with the sash closed, locked, and adjusted. The contractor shall furnish duplicate copies of an air infiltration test performed by an approved commercial testing laboratory certifying that the type of windows being furnished meet the above requirement.

(3) Provisions for Glazing. - Unless otherwise detailed or specified, fixed sash and ventilator sash shall be designed for securing glass from inside with metal glazing beads. Metal glazing beads may be integral with sash member or applied. Where vinyl gaskets are used with metal beads for securing glass, the vinyl shall be of light gray color unless otherwise directed and shall be furnished with windows.

(4) Mastic. - Metal to metal joints between members of metal windows and metal frames and elsewhere as required shall be set in mastic of the type recommended by the window manufacturer to provide completely watertight joints. Excess mastic shall be removed before it hardens.

(5) Poles. - One tubular aluminum pole or round hardwood, varnish-finished pole with pulldown hook and one pole hanger shall be provided in each room or space where pole operation of windows is required.

c. Windows. - (1) General Requirements. - Aluminum windows shall conform to the Aluminum Window Manufacturer's Association Specifications for Aluminum Windows except as modified herein.

(a) Cleaning. - After fabrication, fabricating oil, scratches, and tool marks shall be removed from the aluminum surfaces, and the surfaces shall be free from discoloration, blemishes, and defects.

(b) Mill or Etched Finish. - Aluminum surfaces shall have a natural as-fabricated mill finish; or, at the contractor's option, surfaces shall be given a satin finish by caustic soda etching or by standard mechanical methods. Surfaces shall be protected from handling marks until protective coatings are applied.

(c) Protective Coating. - After cleaning and finishing and prior to shipment, two coats of a clear, colorless, methacrylate lacquer shall be applied to all surfaces of the aluminum. The lacquer shall conform to A.W.M.A. Performance Specifications for Clear Coatings for Aluminum Windows.

(d) Protection from dissimilar materials. - In addition to the protective coating specified, aluminum surfaces shall be protected from direct contact with dissimilar materials as follows:

1. Dissimilar metals, including galvanized ferrous metals, but excluding stainless steel and solid zinc sheet, shall be painted with a heavy brush coat of zinc-chromate primer conforming to Military Specification JAN-P-735 & Am-1, and two coats of aluminum paint or a heavy brush coat of alkali-resistant bituminous paint conforming to Military Specification MIL-P-6883, or shall be separated from the aluminum by a heavy coat of mastic calking compound or by a nonabsorptive tape or gasket. Aluminum paint shall consist of aluminum paste conforming to Federal Specification TT-A-468a & Am-1, type II, class B; thinner compatible with the varnish; and varnish conforming to Federal Specification TT-V-119, & Int. Am-1, mixed in the proportion of 2 pounds of paste to not more than 1 pint of thinner to 1 gallon of varnish. The paste, thinner, and vehicle shall be field-mixed.

2. Aluminum surfaces in contact with mortar, concrete, or other masonry materials shall be given one heavy brush coat of bituminous paint conforming to Military Specification MIL-P-6883.

(e) Hardware. - Hardware for aluminum windows shall be cast bronze with a dull chrome finish, white bronze, nonmagnetic stainless steel with a satin finish, or cast aluminum.

(2) Projected Windows. - Projected windows shall conform to A.W.M.A. Specifications for Aluminum Windows for P-A2 commercial type intermediate projected, with modifications as follows:

(a) Where ventilators are more than 6 feet above the floor, hardware for operation by pole shall be provided. The fastener shall be located in the center of the frame.

d. Insect Screens. - (1) Location. - Insect screens shall be provided for all window vents.

(2) General. - Aluminum screen frames shall be provided for aluminum windows. Screens shall fit closely around the entire perimeter of each ventilator or opening, shall be rewirable, easily removable from inside building, and interchangeable for ventilators and openings of the same size. Hardware, guides, stops, clips, bolts, and screws shall be furnished as required for a secure and insect-tight

attachment to window. Material and finish of hardware and finish of screen frames shall be as specified for windows. Horizontal cross bracing of screens shall be provided at approximate center of frames. Bracing shall be located opposite meeting rails or horizontal muntins.

(3) Aluminum-frame screens. - Aluminum-frame screens shall conform to A.W.M.A. Specifications for Aluminum Windows. The frames shall have removable splines of aluminum or vinyl. Screening shall be 18-by-18 mesh and of aluminum conforming to Federal Specification RR-S-141a & Am-1, type VII.

e. Glass. - Glass shall conform to the requirements of Federal Specification DD-G-451, Flat, Type II, A quality, double strength, clear glass.

f. Glazing. - Glass shall be secured in place with beads of stainless steel or extruded vinyl, or a combination of both. Beads shall be of type that can be easily removed to permit reglazing without dismantling or unfastening corners of sash. Glass shall be secured from inside. Prior to setting glass the outside surface of sash in contact with glass shall be coated with an approved type of rubber cement or elastic glazing compound on which the glass shall be bedded.

g. Installation. - (1) General. - Installation shall be done by the window manufacturer or his authorized representative, using only skilled window mechanics. Windows shall be set in prepared openings. Windows shall be set plumb, level, in alinement, and properly brased to prevent distortion. Ventilators and operating parts shall be protected against accumulation of cement, lime, and other building materials by keeping ventilators tightly closed.

(2) Window Anchors. - Window anchors shall be properly spaced not exceeding 24 inches apart and set in masonry openings during progress of wall construction.

(3) Adjustment. - After window installation and completion of glazing and painting, windows and operating hardware shall be adjusted to provide free operation and watertight conditions when sash are closed and locked. Hardware and operating parts shall be lubricated or waxed as required.

(4) Feeler Gage Field Tests. - After installation and adjustment of solid section nonweatherstripped windows in heated buildings, the metal-to-metal contacts between ventilators and their supporting frames shall be such that when the ventilator is closed and locked, a steel feeler gage 2 inches wide by 0.020 inch thick cannot be freely inserted at any point of contact.

h. Protection. - Care shall be used in handling windows during transportation and at the job site. Windows shall be stored at the site on edge and under cover. After installation, windows shall be protected from damage during subsequent construction activities.

i. Cleaning. - Metal surfaces of windows shall be cleaned on both the inside and outside of all mortar, plaster, paint, and other foreign matter to present a neat appearance and prevent fouling of weathering surfaces, weatherstripping, or the operation of hardware. In addition, aluminum windows shall be washed with a stiff-fiber brush and soap and water and thoroughly rinsed with clear water. Where aluminum windows have become stained or discolored, the windows shall be cleaned or have finish restored in accordance with recommendations of the referenced trade association publication. Stained or discolored windows that cannot be satisfactorily repaired shall be replaced with new windows at no additional cost to the Government.

16-10. ALUMINUM LETTERS. - a. General. - The contractor shall furnish and install the aluminum block letters on the intake structures as indicated on the drawings. Shop drawings and photographs of the letters shall be submitted for approval. All surfaces of castings shall be true planes, uniform in size with straight corners and arrises, and parallel lines parallel. All castings shall have a smooth sand finish without apparent pits or fins and any rough projections shall be carefully removed.

b. Castings. - Cast aluminum shall conform to Federal Specification QQ-A-601b, Class 2M, Commercial Alloy 43, with anodized coatings.

c. Lettering. - The size of the lettering shall be as indicated. Lettering shall be "Broadway" and attached as indicated. Standard letter patterns may be used with the provision that the letters, and the method of attachment of base to concrete will be subject to the approval of the Contracting Officer.

16-11. FLASHING. - a. Copper Flashing. - All flashings shall be copper and, unless otherwise indicated or required, shall be 16-ounce cold-rolled copper conforming to Federal Specification QQ-C-576a, for COPPER PLATES, ROLLED BARS, SHEETS, AND STRIPS. Scuppers are specified in Paragraph 16-18 "SCUPPERS" of this section.

b. Soldering. - All edges of uncoated sheet metal to be soldered shall be pretinned before soldering is begun. Soldering shall be done slowly with well-heated coppers so as to thoroughly heat the seam and completely sweat the solder through the full width of the seam. Ample solder shall be used and the seam shall show not less than one full inch of evenly flowed solder. For all materials, soldering shall follow immediately after application of the flux. Upon completion of soldering, acid shall be neutralized and surfaces shall be thoroughly cleaned.

c. Seams. - Seams shall conform to the following requirements:

(1) Standing seams shall finish not less than one inch high.

(2) Flat lock seams shall finish not less than 3/4 inch wide.

(3) Soldered lap seams shall finish not less than one inch wide.

(4) Unsoldered plain lap seams shall lap not less than three inches.

(5) All seams shall be made in the direction of the flow.

d. Expansion Joints. - Expansion joints shall be provided at intervals of not over 30 feet in all continuous runs of sheet metal work.

e. Cap Flashings. - Cap flashings shall turn down over base flashings not less than 4 inches. The upper edge of cap flashing inserted in open-type reglets shall be secured with coiled-copper strips or lead plugs spaced approximately 12 inches on centers. The cap flashing shall be formed to provide spring action against the base flashing.

f. Reglets. - Reglets for flashing to concrete shall be provided and shall be set in the forms where and as shown on the drawings, or required to provide watertight connections. Reglets shall be a manufactured product constructed of sheet copper of approved design and shall be complete with all fittings and special shapes as may be required so as to be weathertight. Reglets of all types shall have edges bent to an angle of at least 45° F., of sufficient width to provide firm and secure anchorage into the wall construction. Open-type reglets shall be fitted with fiberboard or other suitable separators to prevent crushing or filling of the slot during placing of concrete. Reglets shall be secured in the concrete forms with double-head copper nails spaced not over 12 inches on centers. Metal flashing shall be secured in open-type reglets by means of soft copper or lead plugs spaced not over 12 inches on centers, with grooves filled with calking compound and calked smooth after application.

16-12. EXTERIOR HOLLOW METAL DOORS. - a. General. - The contractor shall furnish all material and hardware for, and install complete, the entrance doors, frames, and mouldings for the structures as indicated on the drawings.

b. Material. - All material shall be of the best grade open hearth, cold-rolled, full-pickled, annealed and reannealed patent leveled furniture ingot iron. Gages referred to are all U. S. Standard and are the minimum acceptable for this work. Doors shall be of hollow metal construction, 1-3/4 inches thick and of 16-gage stock. Top and bottom of doors shall have stiffener channels welded to side plates, and shall be reinforced by formed steel, Z-bar sections extending full height and spaced not over 6 inches on centers. Sound-deadening cork board strips shall completely fill each space. Exposed welds shall be ground to true, even plane with no grinding marks visible. Doors shall be free from warps, dents or buckles. Doors shall be properly reinforced for hardware and shall be drilled and tapped for application of hardware. Backing for hardware shall be not less than 1/8 inch thick and heavier where necessary to develop full strength of machine screws. Doors shall be mortised for butts and reinforcement provided by door manufacturer. Joints and miters shall be welded full length of hair line joints. Fourteen-gage reinforcements shall be provided for all bolts, locks, and lock strikes. All reinforcements shall be securely welded in place. Mortises shall be neat and carefully fitted to hardware items. Any voids between metals and all mortises where hinges pass through rebates shall be filled with metal, welded in place. Astragals shall be provided.

c. Painting. - The doors shall be shop painted and finished in accordance with the standard practice of the manufacturer. The doors before assembling shall be cleaned and primed with one coat of approved rust-resistant paint baked on, followed by one coat of mineral filler baked and rubbed. The doors shall be finished as specified in Section, "PAINTING".

d. Hardware. - The inactive leaf of each entrance door shall have 2 pair butts, one chain bolt on top and a foot bolt. The active leaf shall have 2 pair of butts, lock and door closer.

Hardware Per Set Double Doors

Butts - 2 pair each leaf, Type T-2147 USP, 5" (non-rising, non-removable pins when doors are closed) (weld jamb leaf). Oilite bearing butts may be furnished at contractor's option.

Foot bolt, type 1021B modified for 8"
Chain bolt, type 1021A modified for 8".
Door closer, type 3001, size VI, with corner bracket.
Lock, type 123A-25.
2 Glynn Johnson door holders, Series 70, size as required.

The above hardware shall conform to the applicable requirements of the following Federal Specifications.

FF-H-106a	Hardware, Builders; Locks and Door Trim.
FF-H-111a	Hardware, Builders; Shelf and Miscellaneous.
FF-H-116c	Hinges, Hardware, Builders.
FF-H-121c	Hardware, Builders; Door Closing Devices.

e. Frames. - Channel frames shall be provided as shown. Bar stop shall be plug welded to frame.

16-13. INTERIOR HOLLOW METAL DOORS. - a. Materials. - Steel for doors and pressed steel frames shall be cold-rolled, stretcher-leveled sheet steel, 16 gage for frames and 18 gage for doors and shall have clean smooth surfaces. Doors and frames shall be given a prime coat conforming to Federal Specification TT-P-636b. Frames shall be type and shape indicated, including channel frame for filter chamber access door.

b. Doors. - Doors shall have faces formed from one continuous sheet. Top and bottom of doors shall have stiffener channels welded to side plate, and shall be reinforced by formed steel sections extending full height and spaced not over 6 inches apart, with compressed cork filler strips in each space. All edges of doors shall present a smooth and clean surface. Joints and miters shall be welded full lengths to hair-line joints. Exposed welds shall be ground to true even plane with no marks or grinding visible. Doors shall be free from warps, dents, or buckles. Doors shall be properly reinforced for hardware and shall be drilled and tapped for hardware to be applied. Backing and reinforcing for hardware shall be not less than 11 gage for mortised hardware and 14 gage for surface applied. Doors shall be mortised for butts and reinforcements provided by door manufacturer. Doors shall be neatly and accurately hung in place and left in easy and perfect working order.

c. Hardware, (Per set swing door).
Butts - 1-1/2 pairs, type T-2127USP, 4-1/2" x 4-1/2"
Latch Set - Type 86N-4
Door Closer - Type 3001, Size III with lacquer finish

Hardware type number shall conform to applicable requirements of Paragraph 16-12d.

d. Filter Chamber Access Door. - Door, sill and frame shall be provided as shown. Door shall be secured to frame and sill. Felt shall be provided to make opening air-tight.

e. Air-Tight Swing Doors. - The air-tight doors shall be provided with a neoprene seal for air-tightness as detailed. The door frames shall be capable of receiving the extruded bronze strip housing the neoprene seal around jambs and heads of doors, as detailed. A threshold seal shall be provided on the air-tight doors, and shall be a jamb actuated type to assure an air-tight seal between bottom of door and floor when the door is in a closed position.

16-14. CARPENTRY. - a. Kitchen Cabinets. - Kitchen type cabinets shall conform to the applicable requirements set forth in Section 34, except wood finish shall be paint grade, and to the details indicated.

b. Shelving. - Shelving shall be of any suitable species, second grade for paint finish. Shelving shall be supported on shelf cleats approximately 3/4 inch by 3-5/8-inches, unless otherwise shown. Shelves shall be of the width indicated and be spaced as indicated or directed.

c. Framing. - Framing for fixed storage shall be No. 2 southern pine or Standard grade Douglas fir or other applicable species. Framing shall be closely fitted, accurately set to required lines and grades and securely fastened in place.

d. Finish. - Interior finish, including door frames shall be machine sanded at the mill and sandpapered smooth at the structure where installed. Finish shall be secured with fine finishing nails (set for putty stopping) and with screws and glue where required. Finish shall be set straight, plumb or level, in perfect alignment, and shall be closely fitted. Door trim shall be in single lengths. Species of lumber shall be at option of contractor, second grade for paint finish. Plywood shall be Douglas Fir, Grade B-B, Int.

e. Plywood Doors. - Doors for fixed storage shall be of Grade B-B, In. Douglas Fir, and shall be provided with three butts per leaf (Federal Specification FF-H-116c, Type 2171 USP, 3" x 5"). Hasp shall conform to Federal Specification FF-H-111a, Type F1405, 4-1/2" size. Padlock shall be provided for door and shall be type EPA, Size 1-1/2 (Federal Specification FF-P-101c).

f. Folding Door. - Folding door shall be wood folding, accordian type, suspended from overhead track, shall be assembled at factory and shall be similar and approved equal to "Pella" folding doors, as manufactured by Rolscreen Company, or approved equal. Type of veneer is optional with the contractor. Doors shall be furnished unpainted but sanded and ready for field painting application.

16-15. GOVERNMENT-FURNISHED ITEMS - GATE SHAFT STRUCTURE. - a. Bronze plaque is specified and included in Paragraph 16-19.

b. The following items shall be Government-furnished and contractor-installed.

(1) Contaminated clothes chute.

(2) Membrane door.

(3) Anti back-draft valve.

All additional items required to complete the installation shall be provided by contractor.

16-16. FIRE EXTINGUISHER. - Provide and mount one fire extinguisher, Type II, conforming to Federal Specification O-E-940, with hanger loop.

16-17. LOUVERS. - a. Fixed Louvers. - Fixed louver for generator intake shall be double offset fixed leakproof style, and fixed louver for generator discharge shall be stationary style, shall be fabricated of aluminum blades securely fastened to rigidly constructed aluminum frame of channel section. Fixed blades and frame shall be No. 14 gage minimum.

b. Screens. - Screen material shall consist of 1/4-inch mesh hardware cloth, aluminum wire in rigid aluminum frame of 1/4-inch mesh galvanized hardware cloth in galvanized or cadmium plated iron frame or 1/4-mesh bronze wire hardware cloth in copper frame.

c. Motorized Louvers. - Motorized louvers shall consist of a set of uniformly constructed aluminum blades with interlocked felted edges. Blades shall be securely fastened to suitable pivot rods which shall be guided in non-ferrous oil-less type bushings of replaceable type or in ball bearing support devices with stainless steel balls and cadmium plated steel races. Blades shall be pivot-connected to a suitable operating bar which shall uniformly position the blades in open or closed position. Movable blades shall be carried in aluminum channel frame. Blades, frame and operating bar shall be constructed of No. 14 gage aluminum minimum. Louvers in the full open position shall afford a minimum of 65% free ventilating area.

d. Damper Motor. - Motors for operation of motorized louvers shall be of the two-position spring return type and shall be suitable for the electric service available. Motors shall be installed complete with all necessary linkage and hardware essential to drive the motorized louver to full open position and hold in that position while energized. Time for full opening of the louver shall be about 30 seconds. Motors shall consist of electrical drive and gears in oil, all mounted within a suitable metal box type housing of leak-proof design which shall be attached to the louver channel or to the building wall.

e. Ductwork. - Ductwork shall conform to applicable requirements of Section 23.

f. Filter. - Filter for air intake louver shall conform to filters specified under Section 24.

16-18. SCUPPERS. - Each scupper shall be installed as shown on the drawings or as directed. All joints shall be locked and soldered. The scupper opening shall be completely lined with 24-ounce copper which shall extend through and project outside of the wall to form a drip on the bottom edge, and shall be formed to return not less than one inch against both faces of the wall or parapet with the outside edges folded under 1/2-inch on the top and sides. The metal lining shall be a little smaller than the scupper opening to allow for expansion and contraction in the connecting metal work. The top and sides of scuppers on the roofdeck side shall be of sufficient length to fold over and be lapped and soldered to the flashing, or be of sufficient length to extend not less than 4 inches into the built-up roofing and shall be formed with a ridge to act as a gravel stop around the scupper inlet. All internal joints shall be locked and soldered. Surfaces to receive the scupper lining shall be coated with plastic cement.

16-19. CANT STRIPS. - Concrete cant strips shall conform to requirements of the light weight concrete fill. Wood cant strips, nailers and blocking shall be of preservative treated fir and shall be installed where indicated on the drawings. Treatment shall conform to Federal Specification TT-W-566a.

16-20. BRONZE PLAQUES. - The bronze plaques with bolts for attaching to the intake structures will be furnished by the Government and installed by the contractor.

16-21. ROOF HATCHWAYS. - Roof hatchways shall be of aluminum similar and approved equal to Babcock-Davis roof hatchway, Model # 4-104 or 6-104 insulated cover and curb and with compensating hinge.

16-22. BRONZE PLUGS. - Bronze plugs complete with brass pipe coupling and chain, in connection with pipe sockets for hatchway guards shall be furnished and installed under this section. Materials shall conform to the requirements of Section 30.

16-23. PAYMENT. - a. Payment. - Payment for all work specified in this section, including lightweight concrete fill and precast concrete lintels, will be made at the applicable lump sum prices for Item No. 69, "Water Supply Intake Tower - Miscellaneous", and Item No. 68, "Flood Control Gate Shaft - Miscellaneous", which prices shall include all costs in connection therewith except those items for which separate payment is specifically provided for elsewhere in the specifications.

b. Other Items. - Other items in connection with the structures for which separate payment is specified elsewhere in the specifications is designated below:

Description

Cement
Reinforcing Steel
Concrete (except lightweight concrete fill)
Waterstops
Miscellaneous Structural Steel
Miscellaneous Metals
Electrical Work
Traveling Cranes
Float Well and Accessories
Air Vent & Accessories
Diesel-Electric Engine Generator Set
Hatchway Covers and Railing
Gates and Accessories
Heating and Ventilating

SECTION 17

FLOAT WELL AND AIR VENT
(Items 70 & 71)
(Index)

Paragraph No.	Paragraph Title	Page No.
17-01	Scope	17-1
17-02	Float Well	17-1
	a. General	17-1
	b. Materials	17-1
	c. Installation	17-1
	d. Cabinet	17-2
	e. Payment	17-2
17-03	Air Vent	17-2

SECTION 17

FLOAT WELL AND AIR VENT

(Items 70 & 71)

17-01. SCOPE. - The work covered by this section of the specifications consists of furnishing all plant, labor, equipment and materials and performing all operations required for the installation of air vent and float well, and accessories, complete, in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the contract.

17-02. FLOAT WELL. - a. General. - The contractor shall install the float well and accessories as shown on the drawings in the Flood Control Intake Structure.

b. Materials. - (1) Miscellaneous metals including black steel pipe and cast iron pipe shall conform to the provisions of Sections 29, 30 and 31.

(2) Cement asbestos pipe shall conform to the requirements of Federal Specification SS-P-351a, Class 150.

(3) Gate valves shall conform to Federal Specification WW-V-58 for "Valves; Cast Iron, Gate; 125 and 250 Pound, Screwed and Flanged (for Land Use)", Type 1, Class A, Designation OF.

(4) Steel flanged fittings shall be American Standard, Class 150.

(5) Gaskets for flanged joints shall be copper jacketed.

(6) Bell and spigot cast iron fittings shall comply with American Water Works Association specifications for Class 150 pipe.

(7) Inlets and other specials shown on the drawings shall be as shown thereon.

(8) Screws shall be manganese bronze.

(9) Globe valves shall be similar and approved equal to Crane Company 125 pound, iron body globe valve No. 351-1/4 flanged and drilled to the American Cast Iron Flange Standard Class 125.

(10) Flexible pipe connections shall be similar or approved equal to the Dresser Steel Coupling, Style 38.

c. Installation. - (1) Piping. - The contractor shall install all piping and appurtenances required for the float well in a workmanlike manner as shown on the drawings or as directed or in accordance with standard practice. All pipes shall be accurately fitted and shall be worked into place without springing or forcing. The flexible connection at the expansion joint shall be constructed as detailed on the drawings.

(2) Float Well. - The float well shall be installed plumb and true. Variation from the vertical shall not exceed 1/2 inch in the length of the well. The service clamps and the joint between the cast iron adapter and the cement asbestos pipe shall be in accordance with best standard practice and the manufacturer's recommendations.

d. Cabinet. - The cabinet over a float well shall be constructed of No. 16 gage, prime, cold rolled steel, fully pickled, stretcher leveled, resquared, and free from buckle, loose scale, or other surface imperfections. The material shall be dip treated to assure a suitable base for finish. The side panel shall be removable and shall be secured to the cabinet by machine screws as shown and the top shall be punched in accordance with template to be furnished by the Government. Formations shall consist of two right angles at latch side of door, two right angles at hinge side, and one right angle formation at top and bottom. Double wall construction shall be used for drawer fronts. Assembly shall be by electric welding. Box drawers shall be mounted in channel slides with automatic stops, and shall be so constructed as to reduce friction and noise in operation. Drawer pulls, latch handles and bottom edge scribe piece shall be of bronze brush finish, and shall be secured with concealed fasteners.

e. Payment will be made at the contract lump sum price for Item No. 70, "Float Well and Accessories", and shall include all costs for the cabinet, steel pipe supports and all piping, valves and fittings incidental thereto out to and including the inlets to provide for a complete system, as shown on the drawings. The recording instruments, including float, tape and counterweight will be provided and installed by the Government.

17-03. AIR VENT. - a. General. - The contractor shall install the air vent and accessories complete as shown on the drawings. Piping shall be supported for alignment during concreting operations.

b. Materials. - (1) Miscellaneous metals including air intake at gate frames, shall conform to requirements of Sections 29, 30, and 31.

(2) Air vent piping shall confirm to Paragraph 17-02b(2).

(3) Bolts shall be Class C steel conforming to Federal Specification FF-B-571a unless otherwise noted.

(4) Structural steel for supports, transition sections, etc., shall be Type II conforming to Federal Specification QQ-S-741a.

c. Installation. - Installation shall conform to the applicable requirements of Paragraph 17-02. The air vent piping shall be furnished and installed as indicated on the drawings.

d. The gate air vent grille shall be detachable. At each anchor, a hole shall be drilled and tapped for receiving the cap screws used in fastening the grille to the frame. The cap screws shall be of brass or bronze and included with the frame.

e. The vent linings forming the air shaft transition at each gate shall be provided as indicated. The vents shall be installed as shown and shall be braced internally to maintain their shape during placement of concrete; such bracing to be removed after completion of concrete work.

f. Payment. - Payment will be made at the contract lump sum price for Item No. 71, "Air Vent and Accessories" and shall include all costs for the installation of the complete air vent system including air intake connections at gate frames, header, adapter to pipe, steel pipe, transition, vent grille, and all fittings, anchors, steel supports, and air vent grille and frame, and incidentals thereto.

SECTION 18

SLUICE GATES, VALVES AND ACCESSORIES
(Items 79 and 84)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
18-01	Scope	18-1
18-02	Description	18-1
18-03	Design	18-1
	a. General	18-1
	b. Design Stresses	18-2
	c. Computation of Stresses	18-2
18-04	Drawings	18-2
18-05	Materials	18-2
18-06	Workmanship	18-3
	a. General	18-3
	b. Tolerances	18-3
	c. Machine Finish	18-4
18-07	Gate and Gate Stems	18-4
18-08	Gate Frames and Guides	18-5
18-09	Motor-Operated Hoists	18-6
18-10	Hand-Operated Hoists	18-7
18-11	Conduit Lining	18-8
18-12	Wall Thimble	18-8
18-13	Painting	18-8
18-14	48" Control Valve	18-8
18-15	Installation	18-9
18-16	Inspection and Tests	18-9

Paragraph No.	Paragraph Title	Page No.
18-17	Guarantee	18-9
18-18	Tools and Operating Instructions	18-9
18-19	Payment	18-10

SECTION 18

SLUICE GATES, VALVES AND ACCESSORIES
(Items 79 and 84)

18-01. SCOPE. - a. This section covers designing and installing gates, with frames, guides, stems, hoists, conduit linings, control valve and accessories, complete, for the Water Supply Intake Tower and Flood Control Gate Shaft.

b. Any item or part necessary for satisfactory operation of the gates, valves, and accessories shall be installed by the contractor whether or not such part or item is shown on the drawings or mentioned in the specifications.

18-02. DESCRIPTION. - a. The cast iron gates shall conform to Federal Specification QQ-I-652a, Class 60. The gates shall be rectangular in shape and provided with seals to make them watertight within practicable limits when closed. The gates and appurtenant parts shall be the product of a reliable manufacturer who can show at least 5 years of successful experience in the manufacture of similar gates.

b. The gates shall be operated by electric motor or hand operated screw hoists as indicated on the drawings.

c. The conduit linings and wall thimble shall be of cast iron conforming to Federal Specification QQ-I-652a, class 30, and shall be installed at the locations shown on the drawings.

18-03. DESIGN. - a. General. - The contractor shall design the gates with their frames, guides, stems, and hoists. All gates shall be designed structurally for a maximum pool elevation of 591.0. The design shall be such that the gates will be satisfactorily raised and lowered at the speed and load conditions indicated below.

(1) 48" x 96" motor operated gates in Flood Gate Shaft. - 9 inches per minute at all heads up to and including maximum pool elevation.

(2) 36" motor-operated gates in Water Supply Intake Tower. - 12 inches per minute at all heads up to a maximum head of 91 feet above sill elevation.

(3) 48" and 12" hand-operated gates in Water Supply Intake Tower - heads up to 15 feet above sill elevation. - The opening and closing forces shall be based on a coefficient of friction of 0.6 on the gate and shall include allowances for the weight of the gate and gate stem. Streamlining features of the gate leaves, frames, and conduit lining indicated on the drawings shall be incorporated into the design. The gate stem, gate leaf and gate hoist support shall be designed to withstand the forces produced by the maximum torque of the gate hoist motor with resultant stresses not in excess of the 75 percent yield point of the material involved.

b. Design Stresses. - (1) Cast Iron. - A factor of safety of fifteen shall be used for castings subject to severe shock or vibration, a factor of safety of ten shall be used for castings subject to mild shock, and a factor of safety of six shall be used for all other castings. Gate leaves, frames and frame extensions shall be considered to be subject to severe shock, and hoist pedestals shall be considered to be subject to mild shock.

(2) Unit stresses in other materials shall be in accordance with the best current engineering practice, but in no event shall the unit stress exceed 20 percent of the specified minimum ultimate strength of the material to be used.

c. Computation of Stresses. - (1) Computation of stresses shall take into account all dead and live loads, including allowances for impact, acceleration, and deceleration.

(2) Gate Stem. - The gate stem shall be designed as a short column with an l/r not greater than 120. The minimum allowable unit stress in the gate stem in compression shall be determined from the column formula for main members on page 207 of the latest edition of the Steel Construction Manual by the American Institute of Steel Construction.

18-04. DRAWINGS. - a. The drawings show certain required and limiting dimensions and other general requirements for the construction and operation of the gates and hoists, but are not to be taken as defining the detailed design of the gates, hoists and appurtenances.

b. The contractor shall submit assembly and detailed drawings and other information to demonstrate fully that all parts of the equipment will conform to the requirement and intent of the specifications. The information shall be submitted in conformance with the requirements of paragraph SC-4 and shall include the following.

(1) Drawings and data specified in Section 25 covering electrical equipment, including schematic and wiring diagrams.

(2) Design computations of the hoists, gates and gate stems.

(3) Shop drawings of all parts except parts of components which are of standard manufacture.

(4) Manufacturer's assembly drawings or cuts and catalog data of parts or components of standard manufacture showing sizes, ratings, overall dimensions and mounting dimensions.

18-05. MATERIALS. - a. All materials used in the construction of the equipment shall be the best available for the purpose, considering strength, durability, and the best engineering practice. Unless otherwise specified, all materials shall conform to the requirements of the latest applicable Federal Specifications, or in case there are no applicable Federal Specifications, to applicable specifications of the American Society for Testing Materials. Metal and miscellaneous material shall conform to the requirements indicated on the drawings or referred to in these specifications and when not covered thereby, metals and materials of standard quality shall be furnished. Materials shall be of the classification and grades approved by the Contracting Officer. Products other than those specified herein may be accepted when it is proved to the satisfaction of the Contracting Officer that they are equal in strength, durability, usefulness, and convenience for the purpose intended. In case the contractor desires to use stock material not manufactured specifically for the work covered by these specifications, he shall submit evidence satisfactory to the Contracting Officer that such material conforms to the requirements of the specifications, in which case detailed tests of these materials may be waived. Whenever requested to do so, the contractor shall submit to the Contracting Officer two certified copies of tests of all materials he proposes to use in the manufacture of the equipment. The results of these tests shall be in such form as to afford means of determining compliance with the applicable specifications for the materials tested. The cost of making all the above required tests shall be borne by the contractor. The Contracting Officer shall have the right to select, test and analyze, at the expense of the Government, additional test specimens of any or all of the materials to be used. The results of such tests and analyses shall be considered of equal value to the tests made by the contractor to determine compliance with the applicable specifications for the material used.

b. Unless otherwise specified herein, the requirements of Sections 30 and 31 shall apply to the materials used in the construction of the gates, valves and accessories.

18-06. WORKMANSHIP. - a. General. - All work shall be done and completed in a thorough, workmanlike manner, and shall follow the best modern practice in the manufacture of high grade machinery, notwithstanding any omission from the specifications and drawings. All work shall be done by mechanics skilled in their various trades, and whenever possible all parts shall be made accurately to standard gage to facilitate replacement and repair.

b. Tolerances. - Tolerances and clearances specified on the drawings shall be closely adhered to and the machine work shall in all cases be of high grade workmanship and finish, carefully performed to the satisfaction of the Contracting Officer. Where tolerances or fits are not specified on the drawings, the contractor shall follow the best modern shop practice for equipment of the type covered by these specifications, due consideration being given to the special nature or function of the parts and to the corresponding accuracy required to secure proper operation.

c. Machine Finish. - (1) The type of machine finish, where not otherwise specified, shall be that most suitable for the part to which it applies. Surfaces shall be machine finished wherever an "f" or other mark denoting machine finish appears on the drawings, and on all other surfaces where necessary to insure proper fitting together of parts. Welding, plugging, or shimming to correct defects of material or workmanship will be permitted only where such defects do not affect the strength or interfere with the correct functioning of the part.

(2) So far as practicable, all work shall be laid out to secure good matching or adjoining unfinished surfaces. Any discrepancy between adjoining unfinished surfaces shall be corrected by chipping, grinding or machining to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown on the drawings, and shall be chipped or ground free of wall projections or rough spots.

18-07. GATE AND GATE STEMS. - a. The gates shall be of the pressure seating or unseating type as indicated on the drawings. Each gate leaf shall consist of a rectangular plate with horizontal and vertical ribs. Unseating gates shall be provided with wedges to effect proper seating. The bottom surface of the gate where indicated shall be designed to effect a surface seal with a Babbitt seat flush with the conduit floor. Babbitt shall conform to Federal Specification QQ-T-390, grade 3. The bottom edge of the gate shall be streamlined as shown on the drawings, so that the gate may be operated in part open position without serious vibration. Seal bolts shall conform to Federal Specification QQ-M-80, half hard.

b. Seal Strips. - (1) Flood Control Gates. - The seal strips of the gate leaves shall be constructed of bronze conforming to Federal Specification QQ-L-225, Composition 6. The seal strips shall be machined to a snug fit with their bearing seats to provide watertight joints between seal strips and their respective bearing seats.

(2) Each bearing seat shall be coated with a thin coat of white lead paste mixed in linseed oil, immediately after which the seal strips shall be assembled on their bearing seats in the casting and the seal screws held in place by lock pins or other approved means to prevent loosening. The seal screws shall be of the same material as the respective seal strips. The seal screws for the bronze seals should be provided with a special twist-off head for tightening. (The special head shall project beyond the regular countersunk head and shall be designed to shear off when the screw is tight.) After attaching the seal strips, the sliding surfaces shall be machined to a true plane.

(3) Water Supply Gates. - The gate frame and gate leaf shall have machine finished grooves into which the bronze seal strips shall be pressed and securely anchored in place. The bronze seal strips shall be machined to a true surface after installation on both the gate frame and gate leaf.

c. The gate leaf shall have an integrally cast pocket in the center of the leaf near the top. The pocket shall be reinforced by ribs and shall be fitted for a solid maganese bronze thrust nut. The thrust nut shall be threaded and keyed to the gate stem and shall be designed to withstand the imposed thrust of the gate stem.

d. Each gate shall be provided with a rising type gate stem capable of withstanding the maximum thrust of the hoist and motor. The gate stem shall be made of cold rolled steel. A torque plate at the base of the floor stand shall be provided to eliminate torque in the gate stem. The gate stem shall be of a length to suit the hoist, and shall be furnished in sections of a length to suit the stem quide locations shown on the drawings. The sections of each stem shall be jointed together by solid manganese bronze couplings threaded and keyed to the stems. One coupling shall have left hand threads. Each stem shall be provided with stem guides and steady bearings located as shown on the drawings. All stem guides shall be bronze bushed and adjustable. The bronze bushings in the stem guides shall be securely locked into the guide.

18-08. GATE FRAMES AND GUIDES. -. The gate frames shall be cast iron of the standard flat frame, flange frame type as indicated on the drawings and shall have the surfaces machined and drilled to attach to the conduit linings and the front faces machined to take the gate guides and seal strips. Seal strips constructed of bronze as specified below shall be attached to the gate frame and frame extension in the same manner as specified in Paragraph 18-07b for the gate leaf. Frame seal strips shall be of the following composition.

	Percent
Copper	82-83
Tin	6.75-7.5
Lead	4.5-5.0
Zinc	5.0-6.0

Gate frame extension shall be of ample length to permit full length seating when the gate leaf is in the full open position. The gate frames for the flush bottom gates shall be provided with a Babbitt lined bottom seal to provide a seating face flush with the conduit floor to match with the seating face on the bottom of the gate leaf. Babbitt shall conform to Federal Specification QQ-T-390, Grade 3. This bottom frame seal shall be bolted to the frame. The guides shall be of cast iron, of heavy sections reinforced with ribs as necessary. The guides shall be of sufficient length to permit the gate leaf to be fully within the guide when the gate is in the full open position. Bronze bolts, conforming to Federal Specification QQ-M-80, Class A, half hard, shall be used to fasten the guides to the gate frame and for seal bolts. All anchor bolts and nuts shall be of stainless steel conforming to Federal Specification QQ-S-763b, Class 301 or 321.

18-09. MOTOR-OPERATED HOISTS. - a. The electric-motor driven screw hoist shall be constructed of high grade cast iron, with provisions for attaching stem covers to the top cover plate. A suitable torque plate shall be provided at the base of the pedestal. Electric contactor and push botton cases shall be cast as integral parts of the pedestal or shall be bolted to the pedestal and shall have cast iron covers with machine and gasketed watertight and dust-tight joints. All gears shall be of steel, except for the worm gear, if used, which shall be bronze, and properly designed for the service intended. The gear shafts shall have bronze-bushed bearings and suitable provisions shall be made for lubricating the bearings and gears. Gearing shall be enclosed in dust tight casings.

b. The hoist shall be operated by an electric motor with a handwheel for hand operation of the hoist when desired. The handwheel shall be disengaged by means of an automatic throw-out device so that the handwheel will not revolve during motor operation. An interlock shall be provided to prevent the motor from starting when the handwheel is engaged or provisions shall be made for automatically disconnecting the handwheel when the motor is started.

c. A stem cover pipe shall be fitted with a flange for bolting to the top of the pedestal and a suitable visual indicator shall show the exact position of the gate at all times. Each gate position indicator shall be clearly visible from the hoist push button station.

d. The electric motor shall be a squirrel cage type induction motor mounted in a splash-proof and drip-proof frame. Insulation shall be special Class A, moisture and oil-proof. The motor shall be rated at the horsepower required to give a gate hoisting speed of nine inches per minute and designed to operate at 440 volts, 3 phase, 60 cycles, A.C. The motor shall be the high starting torque, normal starting current type NEMA, Design C, and shall be designed for 30-minute operation at rated load and voltage without exceeding a temperature rise of 55 degrees C. above an ambient temperature of 40 degrees C.

e. The motor control shall consist of a magnetic, reversing type contactor, for starting the hoist motor across the line. Three overload devices shall be provided in each starter. The contactor shall consist of two 3-pole contactor elements mechanically interlocked, and magnetically operated by means of a three-button push button station for raising, lowering, and stopping the gate. Control circuits shall be arranged to provide low voltage protection. The contactor shall be of ample size for the motor which it is to control and shall be rated for service at 480 volts, 3 phase, 60 cycles, A.C. with 120-volt control circuit transformer.

f. Quick break limit switches shall be provided that will cut out the motor at any predetermined position on the opening movement of the gate. Al electrical torque switch shall be provided in the closing side of the gate movement control and shall be arranged to open the motor circuit when the gate is seated or strikes an obstruction. In addition, a mechanical limit switch shall be provided on the down direction. The switches shall be housed in oil tight cases and shall be equipped with quick-break contacts with micrometer adjustment.

g. The push button control stations shall be provided with watertight enclosures and shall be made an integral part of the hoist stand assembly, with "open", "close" and "stop" buttons plainly indicated. Three indicating lamps, a white lamp for "in-gear", a green lamp for "open" and a red lamp for "closed", shall be furnished on each control station. If the unit has an automatic handwheel release, the white light will not be required.

h. All equipment wiring installed by the manufacturer as part of the equipment shall be placed in suitable ducts cast in the stand or accessories, or shall be run in steel conduit. Insulated wire shall be 600v oil base rubber meeting the requirements for insulated wire and cable as specified under the applicable section on electrical work. The wiring shall terminate at a suitable enclosed terminal block.

i. Unless otherwise specified, all electrical materials, workmanship and test shall be in conformity with the current standard rules, regulations and specifications of the American Institute of Electrical Engineers and of the National Electrical Manufacturers Association.

18-10. HAND-OPERATED HOISTS. - a. The hand-operated hoists shall be a manufacturer's standard product, made of cast iron and suitable for manual operation. When operating by hand the required pull on the handwheel or crank to open or close the gate should not exceed 40 pounds. The hoist shall be fitted with a bronze operating nut, anti-friction bearings of ample capacity to carry the thrust load on the nut and other gearing. Gears shall be steel with machine cut heat treated teeth to resist excessive wear. Suitable provision shall be made for manual lubrication of all working parts subject to wear.

b. Torque Plate. - The floor stand shall be mounted on a torque plate to prevent stem twist mounting. Bolts of ample size shall be provided to attach the torque plate and floor stand and to anchor the torque plate to the foundation.

c. Stem Cover. - The gate stem shall be protected by a cylindrical cover with a cap and a flange for attaching to the top of the floor stand.

d. A suitable gate position indicator shall be provided and mounted on the floor stand in such a manner that the operator can observe the position of the gate at all times.

18-11. CONDUIT LINING. - The cast iron conduit linings conforming to Federal Specification AA-I-652a, Class 30, shall be furnished as indicated on the drawings.

18-12. WALL THIMBLE. - a. The wall thimble shall be cast iron, type "F", twelve-inch depth, with a machine finished face for contact with the gate frame. The thimble shall be equipped with studs and bronze nuts for the gate.

b. All active bolts, studs, nuts, adjusting screws and studs holding gate frame to wall thimbles shall be made of bronze stock conforming to Federal Specification QQ-B-636b, Composition No. 1, half-hard.

18-13. PAINTING. - Before exposure to the weather and after thorough cleaning to remove all rust, dirt, grease, and other foreign matter, sluice gates, valves, floor stands, cranks, and similar parts customarily finished at the shop shall be given coats of paint filler and enamel, or other approved treatment customary with the manufacturer. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating. Painting shall conform to the requirements of Section, PAINTING.

18-14. 48" CONTROL VALVE. - The 48" control valve shall be the disc-arm pivot valve type designed for a water working pressure of 150 pounds and shall operate at all heads up to and including the maximum pool elevation of 591.0. The body shall be made of cast steel and shall be heavily ribbed to support the thrust of the hoist. The seat ring shall be of Babbitt accurately finished. The disc shall be made of cast steel with edge accurately machined to fit tightly in the Babbitt seat of the body. The disc and operating arm shall be designed to offer the minimum resistance to flow. The main spindle shall be of forged steel and shall be pressed into the disc. Heavy renewable bronze bearings shall be provided for all moving parts. The bearings for the main spindle shall have adjustable rings which bear against bronze washers in the ends of the disc hubs, to insure tightness at these points. The spindle bearings shall be provided with fittings for force feed lubrication. Bronze bearings shall be provided in the arms of the disc, in the crosshead, and in the ends of connecting rod. The pins in the ends of the connecting rod shall be of rolled bronze. The crosshead guide shall be of cast-iron or cast-steel securely bolted to the top of the body and shall be lined with seamless bronze tube. The crosshead shall be of bronze and shall be provided with packing to prevent leakage up through the crosshead guide. The rod connecting the disc arm to the crosshead shall be of forged steel with an eye at each end fitted with heavy bronze bushings. The stem connecting the crosshead to the hoist shall be of cold rolled steel. The hoist shall conform to the requirements of Paragraph 18-09, "Motor Operated Hoists".

18-15. INSTALLATION. - The gates, gate hoist and accessories, including conduit linings or wall thimble, shall be assembled and installed complete as indicated on the drawings, under the supervision of a representative of the gate manufacturer, and as directed. The gate frame guides and the conduit linings shall be assembled in place and bolted together. The gate leaf shall be placed in the assembled frames and the guides securely bolted to them. The assembled units shall then be checked for alignment and elevation, and the structures shall be substantially anchored in place. After the form work is completed at the ends of the conduit linings, the concrete shall be carefully placed around the frames specified. All bolts, special tools, marks and other devices necessary to erect the gates and linings, and any special anchors required to secure the assembled parts while they are being concreted in place, shall be furnished with the gates. The gate hoists shall be installed in correct alignment with the gates. The gate stems shall be coated with grease with a soap base or other approved compound for protection against rust. All electrical connections shall be made to the motor operated hoists. The limit switches to cut off the motor at each end of the gate travel shall be accurately set at the time of installation. The gate position indicators shall be accurately adjusted at the time of installation.

18-16. INSPECTION AND TESTS. - a. The gates and accessories shall be assembled in the shop as directed for inspection and to insure that all parts fit accurately and are in proper alignment. Each gate shall be opened and closed to insure proper operation.

b. After completion of the gate structure and gate house and the installation of all machinery, each gate shall be tested under the supervision of gate manufacturer's representative for satisfactory operation by being raised and lowered at least three times for its full length of travel. Any adjustment in the setting or installation required to secure satisfactory operations and tight closure of the gates shall be made by the contractor. The gate hoists and motors shall be tested as directed and any adjustments or changes that may be required, in the opinion of the Contracting Officer, shall be done by the contractor.

18-17. GUARANTEE. - The gates, valves and accessories to be furnished under this section of the specifications shall be guaranteed in accordance with the guarantee provisions of the SPECIAL CONDITIONS.

18-18. TOOLS AND OPERATING INSTRUCTIONS. - The contractor shall furnish a complete set of all special tools needed for the adjustment operation and maintenance of the gates, valves, and accessories; five complete, bound lists of parts with necessary illustrations and references to permit convenient ordering of repair parts; and five bound complete, clear and concise sets of instructions for the operation, adjustment, lubrication and maintenance of the gates, valves and accessories furnished under this section.

18-19. PAYMENT. - a. Payment for designing, furnishing and installing the gates, guides, frames, valves, stems and hoists, and conduit linings will be made at the applicable contract prices for Item Nos. 79 and 84, "Gates and Accessories". Payment shall include all necessary accessories not included under any other item and all costs of furnishing the services of a representative of the gate manufacturer.

b. Partial payment up to 70 percent of the contract price for each item but not exceeding the manufacturer's price to the contractor will be made when the equipment has been satisfactorily shop tested and delivered complete at the site of the work.

c. Final payment of the contract prices will be made after the field tests are satisfactorily completed in accordance with Paragraph 18-16.

d. Payment for testing shall be included in the contract price for "Gates and Accessories".

SECTION 22

TRAVELING CRANES
(Items 80 and 85)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
22-01	Scope	22-1
22-02	Applicable Specifications	22-1
	a. Shaft Steel	22-1
	b. Steel Springs	22-1
	c. Crane Wheels	22-1
	d. Wire Rope	22-1
	e. Set Screws	22-1
	f. Machine Screws	22-2
	g. Cap Screws	22-2
	h. Washers	22-2
	i. Rails	22-2
	j. Specifications	22-2
	k. General Design	22-2
22-03	Type and Description	22-2
22-04	Capacities and Speeds	22-2
22-05	Workmanship	22-3
22-06	Design Requirements	22-3
22-07	Materials	22-3
22-08	Bridge	22-3
22-09	Bridge Trucks	22-4
22-10	Wheels	22-4
22-11	Bearings	22-4
22-12	Bridge River	22-4
22-13	Trolley	22-4

Paragraph No.	Paragraph Title	Page No.
22-14	Trolley Drive	22-5
22-15	Hoisting Drums	22-5
22-16	Hoisting Ropes	22-5
22-17	Sheaves	22-5
22-18	Hoisting Blocks	22-5
22-19	Gears and Shafts	22-5
22-20	Load Brake	22-5
22-21	Operating Wheels and Chains	22-5
22-22	Brakes	22-6
	a. General	22-6
	b. Electric Supply	22-6
	c. Control Box	22-6
	d. Motor	22-6
	e. Limit Switches	22-6
	f. Overload Cutoff	22-6
22-24	Safety Devices	22-7
22-25	Bolts and Nuts	22-7
22-26	Lubrication	22-7
22-27	Wrenches and Tools	22-7
22-28	Name Plate	22-7
22-29	Field Tests	22-8
22-30	Painting	22-8
22-31	Guarantee	22-8
22-32	Payment	22-8

SECTION 22

TRAVELING CRANES

(Items 80 and 85)

22-01. SCOPE. - This section covers the designing, manufacturing, painting, delivering, installation, field testing and placing in satisfactory operation the overhead travel cranes in the Water Supply Intake Tower and the Flood Control Operating House, complete, with all appurtenances.

22-02. APPLICABLE SPECIFICATIONS. - The folliwing specifications form a part of this specification.

a. Shaft Steel. - Steel for shafting shall conform to one of the following specifications:

(1) Federal Specification QQ-S-633a for "Steel Bars, Carbon, Cold Finished and Hot Rolled (General Purpose)."

(2) Federal Specification QQ-S-624a for "Steel Bars, Alloy, Cold Finished and Hot Rolled (General Purpose)".

(3) Applicable specifications of the Society of Automotive Engineers, Inc.

(4) Applicable ASTM specifications.

b. Steel Springs. - Steel springs shall conform to the requirements of ASTM designation A125-52 for "Heat-treated Helical Spings".

c. Crane Wheels. - Steel for the bridge and trolley wheels shall conform to the applicable requirements of ASTM designation A57-60 for "Multiple-Wear Wrought Steel Wheels," Class C, Rim treated.

d. Wire Rope. - Wire rope shall conform to the requirements of Federal Specification RR-W-410a for "Wire Rope and Wire Strand," Type 1, Class 3, 6 x 37, improved plow steel, fibre core, preformed, regular lay, uncoated.

e. Set Screws. - Set screws shall conform to the requirements of Federal Specification FF-S-103a for "Set Screws".

f. Machine Screws. - Machine screws shall conform to the requirements of Federal Specification FF-S-92 for "Screws, Machine; Slotted or Cross-recessed".

g. Cap Screws. - Cap screws shall conform to the requirements of Federal Specification FF-S-85 for "Screws, Caps, Slotted and Hexagon Head" or Federal Specification FF-S-86 for "Screws, Cap, Socket Head".

h. Washers. - Unless otherwise specified or indicated on the drawings, cut washers shall conform to dimensions specified in ASA B27.2-1958, "Plain Washers" for size bolts used. Lock washers shall conform to the requirements of Federal Specification FF-W-84 for "Washers, Lock (Spring)" or ASA B27.1-1958 for "Lock Washers," heavy spring type.

i. Rails. - Rails shall conform to the requirements of ASTM designation A1-58T for "Open-Hearth Carbon Steel Rails", No. 1 rails, ASCE section.

j. Specifications. - Unless otherwise specified, all applicable requirements in Sections 30 and 31 shall also form a part of this section.

k. General Design. - The Overhead Electric Crane Institute Specification 49 shall govern design where applicable.

22-03. TYPE AND DESCRIPTION. - The cranes to be furnished and installed under this section shall be of the indoor, overhead travelling type, equipped with a single trolley having a single electric motor-operating hoist. The crane in the Water Supply Intake Tower shall be of the top running, double beam type. The crane in the Flood Control Operating House shall be of the top running single beam type. The double beam crane shall be provided with an auxiliary I-beam trolley complete with load bar, having a capacity of 1,000 pounds and installed on the upstream beam of the crane. The bridge travel and trolley travel shall be hand operated. The electric motor-operated hoists shall be equipped with pendant controls operable from the main floor of the buildings. Power shall be supplied to the cranes as shown on the electrical drawings.

22-04. CAPACITIES AND SPEEDS. - The capacities and speeds of the cranes shall be as follows:

1.	Rated capacity of hoist, tons	5
2.	Hoist speed, feet per minute	20
3.	Bridge travel speed, feet per minute	Hand operation
4.	Trolley travel speed, feet per minute	Hand operation
5.	Span and lift	As indicated on drawings

22-05. WORKMANSHIP. - Workmanship shall be of the highest grade and in accordance with the best modern standard practice. Parts shall be machined carefully and accurately to jigs and templates, and all like parts shall be absolutely interchangeable. All parts shall conform accurately to the required dimensions and shall be free from defects. All bolt holes shall be drilled accurately to template to the locations called for on the approved shop or working drawings. All machined surfaces shall be faced true. All working parts shall be arranged for convenient inspection, lubrication, adjustment, repair and replacement. After the parts have been accurately fabricated and finally machined, the cranes shall be completely assembled and adjusted in the shop, and there shall be no later fitting or changing of any dimensions on the shop drawings to make the different parts fit properly together.

22-06. DESIGN REQUIREMENTS. - Each crane shall be of standard manufacture, and designed for the purpose for which it is to be used. The crane shall operate within the space shown on the plans, with adequate clearances. Structural design shall be in accordance with the American Institute of Steel Construction (A.I.S.C.) Standards, with factor of safety of not less than five (5) when under the rated capacity loads and based on the ultimate strength of the material used.

22-07. MATERIALS. - No material shall be used for any purpose for which it has not been previously used for a suitable length of time to prove its adaptability for the purpose intended. Before starting the fabrication or manufacture of the cranes, the contractor shall submit to the Contracting Officer for approval specifications covering composition of materials to be used. If requested, test bars and samples shall be submitted. Materials not meeting these specifications or failing to conform to tests shall not be used. All materials used in the crane manufacture shall be of first class quality.

22-08. BRIDGE. - The bridge shall consist of steel riveted or welded girders, or rolled steel beams of suitable size and section, properly reinforced by diaphragms and stiffeners to withstand all strains of loading and impact during operation. The operating machinery and other exposed parts shall be suitably housed so that the exterior of the crane will consist of smooth surfaces of pleasing appearance. Girders shall be so designed that stresses produced in the lower flange by the maximum load shall not exceed 1/5 of the ultimate strength of the material, while the stresses in the top flange shall be limited to the crippling formula employed for compression members, and by lateral strains, due to starting and stopping of the bridge suddenly when fully loaded. The maximum vertical deflection of the girders, produced by the dead load, the weight of the trolley, and the rated load, shall not exceed .00125 inch per inch of span. Impact shall not be considered in determining deflection. Girders shall be rigidly connected with the end trucks, and shall be of such design and construction as to keep the entire bridge structure square and in alignment under all operating conditions. The trolley track rails shall be welded to the tops of the bridge girders, and shall be provided with approved type of end stops.

22-09. BRIDGE TRUCKS. - The bridge trucks shall be of steel construction, thoroughly braced, welded or riveted, and attached to the girders with turned bolts, with all holes drilled and reamed after assembly of parts. Safety lugs shall be provided to prevent excessive drop in case of axle failure. Substantial guards shall be provided in front of each wheel and shall project below the top of the runway rail. The entire truck shall be machined as a unit, so that perfect alignment of all parts is assured. Bridge trucks shall have approved roller bearings, and heat treated chrome nickel steel axles of the rotating or fixed axle type.

22-10. WHEELS. - Bridge truck and trolley wheels shall be double flanged cast iron, chilled iron, or steel, of ample size, machined to uniform diameters. Axles on trolleys shall have anti-friction roller bearings and shall be mounted so as to be easily removable. One wheel at each end of the bridge shall be driven by the cross shaft. The driving pinions and gears shall be protected by approved guards.

22-11. BEARINGS. - Anti-friction roller or ball bearings shall be used on the trolley and bridge wheels and gear shafts. The cross shaft and other slow speed intermediate shafting may be equipped with sleeve type bearings having removable bronze linings, in accordance with the best engineering practice for the application under consideration. The hook shall turn on ball or roller bearings. The roller and ball bearings shall be Timken, Hyatt, S.K.F., or approved equal. The bearing housings shall be split or so designed as to permit easy removal of the shafts. All bearings shall be provided with oil bath or pressure lubrication, and shall be designed, as far as practicable, to exclude dirt and to prevent leakage of oil or grease.

22-12. BRIDGE DRIVE. - The crane shall be driven by one wheel at each end of the bridge. The operating wheel for the pendant chain shall be located as shown on the drawings. The crane shall be driven at each end from a cross shaft, running the full length of the bridge. The cross shaft shall be of ample size, and shall be supported at frequent intervals to prevent undue deflection or whipping.

22-13. TROLLEY. - The trolley frame shall be of welded rolled steel, or cast steel construction, or a combination of both. The frame shall be a rigid unit, designed to transmit the load to the bridge rails without undue deflection. Safety track guards, the same as specified for bridge trucks, shall be provided. Where practicable, all brackets and bearings shall be permanently attached to the trolley frame.

Drum bearings and supports for upper sheaves shall be located so as to equalize the load to track wheels as nearly as possible. The entire trolley frame shall be machined as a unit, so that perfect alignment of all parts is assured. The trolley shall be provided with suitable bumpers at each end, arranged to meet the end stops squarely.

22-14. TROLLEY DRIVE. - The trolley shall be driven by one driving wheel on each side of the trolley. The trolley drive mechanism for the pendant chain shall be located as shown on the drawings.

22-15. HOISTING DRUMS. - The hoisting drums shall be made of high grade cast iron or steel, and shall be designed to withstand the maximum bending and crushing loads. The drums shall be so designed that not less than two complete wraps of hoisting rope will remain in the grooves when the hook is at the lowest position for the lift specified. Drum grooves shall be turned from the solid metal. The drums shall be grooved right and left hand. The pitch diameter of the drum shall be that required by the rope manufacturer for the size and kind of rope used.

22-16. HOISTING ROPES. - The hoisting ropes shall be of proper design and construction for crane service. The stresses used in the design of the rope shall not be greater than 1/5 the nominal breaking strength of the rope.

22-17. SHEAVES. - All sheaves shall be made of cast steel or cast iron. Sheaves shall be provided with bronze bushings or anti-friction bearings, and shall have finished grooves of ample depth. The pitch diameter of the sheaves shall be that required by the rope manufacturer for the size and kind of rope used.

22-18. HOISTING BLOCKS. - The hoisting blocks shall be of steel construction. The hooks shall be forged steel, supported on a ball or roller thrust bearing. The hooks shall rotate freely on the bearing support.

22-19. GEARS AND SHAFTS. - All pinions shall be suitably heat-treated, forged alloy steel. All other gears shall be of annealed cast steel, forged steel, or welded and heat-treated steel. All gear teeth shall be machine cut. No gears or pinions shall be overhung. All shafts and truck axles shall be of forged steel. All shafts, except the bridge drive cross shaft, shall be machined true to size at gear seats and bearings. All shafts shall be removable without removing any parts keyed to them.

22-20. LOAD BRAKE. - Each hoist shall be equipped with an approved type of automatic load brake designed to automatically hold the load, and lower it without acceleration, under full control, by pulling the operating chain in the lowering direction.

22-21. OPERATING WHEELS AND CHAINS. - The operating wheels shall be shrouded and shall be equipped with swinging chain guides that will permit the rapid handling of the operating chain without "gagging" of the wheel, and will also permit a reasonable side pull on the chain. The pendant operating chains shall be sheradized.

22-22. BRAKES. - The hoists shall be provided with two independent braking means (1) an automatic mechanical load brake; (2) an electric motor brake. Either the automatic load brake or the motor brake alone shall be sufficient to sustain the rated load in any position.

22-23. ELECTRICAL WORK. - a. General. - All electrical equipment, material, and workmanship shall conform to the applicable current standard rules, regulations, and specifications of the American Institute of Electrical Engineers, the National Electrical Manufacturers Association, the Underwriters Laboratories, Inc., (N.E.C.), American Standards Association and Section, INTERIOR ELECTRICAL WORK, of this specification. All motors shall be insulated with special Class A moisture and oil proof insulation.

b. Electric Supply. - The electic supply will be 440 volts, 3 phase, 60 cycles.

c. Control Box. - The control box including a full voltage magnetic starter shall be mounted on the hoist and the unit properly balanced. The pendant push button box shall have 4 sets of buttons, 2 for up-down of hoist, one for inching and a dead man button.

d. Motor. - The motor shall be of the squirrel cage type, and shall have ample capacity for the duty and speeds as specified herein. The capacity of the motor shall be such that the specified performance of the crane at rated load will not demand more than full load motor torque. The motor shall be insulated with special Class A moisture and oilproof insulation.

e. Limit Switches. - Limit switches shall be provided to control the upper limits of travel of the crane motor. The limit switch shall be of the totally-enclosed safety type operated by the hook or hook block. The switch shall be readily accessible for adjustment and repair and shall be reset by reversing the travel of the hook. A suitable enclosed type limit switch shall also be provided to control the lower limit of travel of the hoist.

f. Overload Cutoff. - Each hoist shall be equipped with a capacity or load limiting device capable of sensing the load on the hoisting cable. Such service, upon sensing a load greater than 25% of overload, shall interrupt the raising circuit and prevent the hoist from raising the load. The cutoff shall automatically reset upon the removal of the overload. The overload-cutoff shall not increase the minimum headroom. It shall permit easy cable replacement. The overload cuttoff shall not reduce the safety factor of five to one minimum.

22-24. SAFETY DEVICES. - The contractor shall provide all appliances necessary to assure that the cranes shall comply with all applicable safety laws.

22-25. BOLTS AND NUTS. - All bolts and nuts shall conform to the Federal Specification FF-B-571a for "Bolts, Nuts, Studs, and Tap Rivets (and Material for Same)", Class B, and shall be American Standard heavy dimensions, semi-finished with hexagonal heads and cold punched hexagonal nuts. All bolts and nuts shall have clean, true threads, and Class 2 fit. Nuts for bolts subject to vibration and frequent changes of load shall be secured by effective locking devices. If double nuts are used, both shall be of standard thickness.

22-26. LUBICATION. - Lubrication of all mechanical operating parts shall be by means of high-pressure grease, and industrial button-head type fittings shall be used. The lubricating fittings of journals or bearings shall be readily accessible and, where necessary, shall be piped to convenient points, using copper or brass pipe of ample size, adequately fastened. The contractor shall provide a hand-operated grease gun for supplying the lubricant for each crane. The grease gun shall have a capacity of approximately 14 ounces. The grease gun shall be screw-operated by means of a large wing handle, and shall be complete with heavy duty, flexible, metallic hose and pull-on coupling suitable for the button-head type fittings.

22-27. WRENCHES AND TOOLS. - A complete set of wrenches and tools in a pressed-steel tool box shall be furnished for each crane. The tools shall be of sufficient quantity, variety, and type to cover all ordinary maintenance uses in connection with the crane. Each tool and wrench shall be stamped so as to be easily identified as to its size and use. Provision shall be made in the tool box for mounting the grease gun specified in Paragraph 22-26.

22-28. NAME PLATES. - The name plate showing the rated capacity of each crane shall be attached to one bridge girder in an approved location, so as to be legible when viewed from the operating floor. The crane manufacturer will be permitted to supply and attach to the crane structure, in an approved location, a name plate showing the manufacturers name and address and the trade name of the equipment.

22-29. FIELD TESTS. - After installation of the crane has been completed and as soon as conditions will permit,the crane will be subjected to field tests under actual operating conditions to determine compliance with the specifications, and to demonstrate that the equipment has been properly erected, adjusted and in perfect operating condition, ready for service. Should any defects develop during the tests, the contractor shall, without expense to the Government, correct such defects as are due to faulty design, manufacture, or defective materials and workmanship. The tests will include the recording of lifts, and the operation of the load brake with full rated load. The field tests shall be made under the supervision of the contractor and will be observed and witnessed by the Contracting Officer. The method of making the tests shall be subject to the approval of the Contracting Officer. All necessary apparatus and equipment, materials and instruments required for the tests shall be furnished by the contractor. The services of the Manufacturer's Erecting Engineer, necessary for tests, will be included in payment under the contract lump sum prices for Items "Traveling Cranes". The decision of the Contracting Officer as to whether or not the contractor has fullfilled his obligation under the contract shall be final and conclusive.

22-30. PAINTING. - Unless otherwise approved or specified, the cranes shall be painted in accordance with Section 40, PAINTING.

22-31. GUARANTEE. - The overhead cranes shall be guaranteed in accordance with the guarantee provisions of the SPECIAL CONDITIONS.

22-32. PAYMENT. - Payment will be made for the furnishing and installation of each crane will be made at the applicable lump sum contract prices for Items Nos. 80 and 85, "Traveling Crane". Each price shall cover the cost of all labor, material, and equipment, and performing ofoperations in connection with the installation of the crane including any piping, fittings, fixtures, and appurtenances, and all other items incidental to completion in accordance with the specifications herein and the applicable drawings.

SECTION 23

DIESEL, ENGINE-GENERATOR SET
(Item 81)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
23-01	Scope	23-1
23-02	General	23-1
	a. Rating	23-1
	b. Contract Drawings	23-1
	c. Standard Products	23-1
	d. Material and Equipment Schedule	23-1
	e. Shop Drawings	23-2
	f. Operating Instructions	23-2
	g. Miscellaneous Items	23-2
23-03	Diesel-Engine	23-2
	a. General	23-2
	b. Fuel Injection System	23-3
	c. Lubricating Oil System	23-3
	d. Cooling System	23-3
	e. Air Exhaust for Radiator	23-4
	f. Automatic Starting Equipment	23-4
	g. Governor	23-5
	h. Overspeed Stop	23-5
	i. Engine Control Panel	23-5
	j. Flexible Coupling	23-6
	k. Exhaust Piping	23-6
	l. Insulation	23-6
23-04	Generator	23-6
	a. General	23-6
	b. Bearings	23-7
	c. Slip Rings	23-7
23-05	Exciter	23-7
23-06	Fuel Oil Storage Tank and Piping	23-7

Paragraph No.	Paragraph Title	Page No.
	a. Piping	23-7
	b. Fuel Oil Starting Tank	23-7
	c. Fuel Oil Transfer Pump	23-7
	d. Hand-Operated Fuel Pump	23-8
	e. Fliw Indicator	23-8
23-07	Installation	23-8
23-08	Painting	23-8
23-09	Field Tests	23-8
23-10	Guaranty	23-9
23-11	Payment	23-9

SECTION 23

DIESEL ENGINE-GENERATOR SET
(Item 81)

23-01. SCOPE. - This section covers the furnishing and installation of the diesel engine-generator set complete.

23-02. GENERAL. - The set shall consist of a diesel engine, directly connected through a flexible coupling to a revolving field synchronous-type alternating-current generator with a direct-connected exciter, all mounted on a common cast iron or structural steel base and bolted to the floor. The set shall be equipped with a storage battery and electric starting motor, a battery-charging generator, fuel-oil tank, piping, exhaust pipe with silencer, and all other necessary appurtenances for a complete installation. The set shall include a suitable exciter field rheostat for mounting on the steel control panel which shall be installed according to Section, ELECTRICAL WORK, INTERIOR. This paragraph and paragraphs 23-04 and 23-05 describe conventional generator-exciter equipment. However, equivalent equipment of the same output rating having no brushes and using rectified AC for the excitation system may be furnished in lieu of the conventional equipment, subject to approval of the Contracting Officer.

a. Rating. - The generator shall be 3-phase, 480 volt, 60 cycle, 1800 rpm, 3 wire type and shall have an output rating of 75 kw, 93.75 kva., at 80 percent power factor.

b. Contract Drawings. - The contract drawings indicate the general arrangement of the generator set together with its storage tank, silencer, piping accessories. If any departures from the contract drawings are proposed by the contractor, details of such departures and the reasons therefor shall be submitted to the Contracting Officer for approval. No such departures shall be made without written approval of the Contracting Officer.

c. Standard Products. - The engine, generator, and all equipment, materials, and accessories shall be essentially standard products of manufacturers who have had at least 5 years experience and are regularly engaged in the production thereof. Where two or more units of the same class of equipment are required, those units shall be products of a single manufacturer; however, component parts of the system need not be the products of the same manufacturer.

d. Material and Equipment Schedule. - As soon as practicable before commencement of installation of any material or equipment, a complete schedule of the material and equipment proposed for installation plete schedule of the material and equipment proposed for installation shall be submitted for the approval of the Contracting Officer. The schedule shall include catalogs, cuts, diagrams, and complete technical data including rating curves.

e. Shop Drawings. - Complete shop drawings of the engine-generator sets shall be submitted to the Contracting Officer for approval in accordance with Part II, SPECIAL CONDITIONS. The drawings shall show details of installation including electrical connections and shall be fully dimensioned.

f. Operating Instructions. - Complete operating and lubricating instructions, mounted in glass-covered wood frames shall be provided for each unit and shall be posted convenient to the equipment when directed by the Contracting Officer.

g. Miscellaneous Items. - The diesel engine shall be furnished with the following miscellaneous items:

(1) Special tools for regular operation, maintenance, and overhaul of engine.

(2) Two spare injector nozzles.

(3) Engine foundation bolts and sleeves shall be furnished with the engine and delivered to the site prior to delivery of the engine, together with manufacturer's installation instructions. Bolts and sleeves shall be installed by the contractor at the time of pouring the concrete foundation for the engine.

23-03. DIESEL-ENGINE. - a. General. - The engine shall be a full diesel vertical or vee type, two or four cycle, mechanical injection, single acting, or opposed trunk piston type, capable of operating continuously on No. 2 Diesel Fuel Oil. The engine shall conform to the manufacturer's standard design and construction for engines of this type and rating. The net horsepower rating, minimum engine equipment, governor performance, torsional vibration, critical speeds and construction of fully assembled engine generator set, materials and workmanship, shall conform to DEMA "Standard Practices". The engine shall not be required to operate at a rating higher than the manufacturer's published ratings for the speed at which the engine is offered, and after deducting the power consumed by the attached engine-driven auxiliaries, the net brake horsepower continuous rating shall not be less than the power required by its direct connected alternator and exciter when delivering its full rated KW capacity at 80% power factor. The engine shall, further, be capable of delivering for two continuous hours, without smoke or damage to the engine, 10% more horsepower than required by the unit at rated KW output. The B.M.E.P. at the above specified rating shall not exceed 85 p.s.i. for two-cycle and naturally aspirated four-cycle engines; and 135 p.s.i. with intercooler or 120 p.s.i. without intercooler for four-cycle supercharged engines. The rotative speed of the engine at the specified ratings shall not exceed 1,800 r.p.m. The cylinder block shall be of one piece construction with removable liners. Main and connecting rod bearings shall be of the precision removable type. Engine of the two-cycle type shall be equipped with a built-in engine-driven scavenging blower. Engine of the four-cycle type may be either naturally aspirated or supercharged; however, the maximum cylinder pressure of a supercharged engine shall not exceed that of the same engine normally aspirated by more than five percent.

b. Fuel Injection System. - The fuel injection system shall be mechanical type with individual pump and injection nozzle for each cylinder or single pump with individual injection nozzles for each cylinder. A full flow strainer and full flow oil filter shall be provided and mounted on the unit. All fuel oil piping for the engine shall be installed complete including connections to the fuel oil storage tank.

c. Lubricating Oil System. - The lubricating oil system shall be of the pump pressure type with the pressure being supplied by a built-in engine-driven gear pump with necessary relief valves and pressure regulators. A full flow strainer, and a full flow type lubricating oil filter shall be provided. The engine shall be of the wet sump type with all oil stored in the engine crankcase sump without the necessity of an auxiliary tank. All lubricating oil piping shall be completely installed on the unit. An oil-pressure-operator safety shut-off shall be provided to shut off the engine when the oil pressure is too low for safe operation. A device shall be provided to cut out the oil pressure shut-off when the engine is being started.

d. Cooling System. - The cooling system for the engine shall consist of a radiator, engine-driven fan together with centrifugal jacket water pump or pumps. The radiator shall be mounted on the engine structural base directly in front of the engine. The radiator fan shall be driven by V-belt and shall be capable of drawing the air through the intake louver, motorized damper and filter, across the engine and discharge forward through the radiator. Protection for the operators and the cooling cores shall be provided by a metal fan guard, constructed in two pieces and bolted to the fan ring. Automatic temperature regulator shall be provided and installed for the control of the jacket water and the lubricating oil temperatures. The temperature regulator shall be of the type which will maintain full water flow through the engine and full oil flow through the engine. The radiator and fan shall

411

be of proper capacity to adequately cool the engine with an entering air temperature of 100° F. Entire engine cooling system shall be filled with an aqueous solution of ethylene glycol which shall protect the engine and radiator system against freezing at a temperature of minus 20°F. All water and lubricating oil piping shall be installed complete. A water temperature operated shut-off which will shut off the engine when the cooling water exceeds the safe setting shall be provided and installed on the engine. The limit shut-off shall have an adjustable range of approximately 140°F. to 200°F.

e. Air Exhaust for Radiator. - (1) General. - Air exhaust for radiator shall be as shown on the drawings.

(2) Ductwork. - Sheet metal work indicated on the drawings shall be erected in a first-class and workmanlike manner and shall be approved by the Contracting Officer. The ducts shall be sized to fit the louvered wall opening as shown on the drawings and the diesel engine radiator flanged connection. The ducts shall be straight and smooth on the inside, with neatly finished joints. The ducts shall be properly supported from the floor in an approved manner so as to be completely free from vibration under engine operating conditions. The ducts shall be properly braced and reinforced with steel angles or other structural members spaced uniformly. The sheet metal used shall be galvanized iron or steel of 16-gage minimum thickness. Motor operated louvers shall be furnished and installed as specified in Section 16, and shall be controlled by the automatic starting equipment.

(3) Flexible Connections. - A flexible connection shall be provided between the engine radiator and the duct. It shall be made of asbestos or glass fabric, of proper weight and strength for the service, and shall be fitted to be relatively airtight.

f. Automatic Starting Equipment. - The engine shall be arranged for automatic electric starting, and the contractor shall furnish and install all necessary equipment including:

(1) Automatic Starting. - The diesel generator unit shall be equipped with automatic starting and safety shutdown controls which will start the engine automatically by interrupted cranking cycles upon loss of normal power supply. The automatic starting control shall be actuated by a relay in the automatic transfer switch. The cranking cycle shall consist of five cranks with four rest periods between cranks. Crank and rest periods shall be individually adjustable to meet any starting requirements. If the engine fails to start after the cranking cycle has been completed, the control will lock out to discontinue cranking and actuate the "over-crank" signal light on the panel. The control shall also shut down the engine in the event of low oil

pressure, high water temperature and overspeed, and indicate the cause of failure by means of an individual signal light on the panel. There shall also be included on the panel a red pilot light which burns if the control switch is placed in the "Off" position.

(2) Starter. - A 24-volt minimum heavy-duty electric cranking motor shall be provided for starting the engine. The cranking motor shall be controlled by a magnetic switch with a 24v dc coil. The cranking motor shall be capable of cranking the engine at sufficient speed to insure starting.

(3) Battery. - A 24-volt minimum battery shall be provided. The battery shall have sufficient capacity to provide a 3-minute continuous cranking of the complete unit under operating conditions with an ambient room temperature of 32°F. The battery shall have a special plate construction for severe or unusual conditions. Minimum rating shall be 200 ampere hours. The battery shall conform to the specifications for United States Government award by the Treasury Department, Procurement Division, Branch of Supply, for lead-acid storage batteries, Item 17, B8630a-2. A suitable shelf or platform with an acid-proof rubber or lead tray shall be provided and located adjacent to the engine base for mounting the battery. A hydrometer syringe and thermometer shall be included.

g. Governor. - The governor shall be of a type capable of maintaining a constant engine speed under fluctuating load conditions. The difference in speed between full load and 3/4 load shall be not greater than 3 percent of the rated operating speed of 1800 r.p.m. Maximum change in speed, when full load is applied instantaneously, shall not exceed 5 percent of the rated operating speed of 1800 r.p.m. Governor regulating devices shall be so designed that adjustments may be made easily and accurately.

h. Overspeed Stop. - The engine shall be equipped with an overspeed stop which will automatically shut off the fuel in case the engine operates in excess of the rated speed. This overspeed stop shall be separate from regular governor mechanism.

i. Engine Control Panel. - A metal engine control panel shall be provided and installed on the side of the engine as shown on the drawings. The following instruments and equipment shall be mounted on the panel as shown on drawing.

Ammeter

Tachometer

Lubricating-oil pressure gage

Hour-meter

Engine water temperature gage

Run and stop* control

Automatic starting equipment

*Stop button shall have lockout feature to prevent starting engine from remote push button.

j. Flexible Coupling. - A flexible coupling shall be provided between the engine and generator capable of transmitting 300 percent of the normal operating torque of the engine. A guard shall be provided around the coupling.

k. Exhaust Piping. - The exhaust piping shall be provided and installed as indicated on the drawings. The flexible exhaust connection to the engine exhaust manifold shall be seamless, constructed of corrosion resisting metal conforming to the requirements of Federal Specification QQ-S-766c, Class 321, 347 or 348, and shall be similar and equal to that manufactured by Atlantic Metal Hose Co., Inc., New York. The piping shall be standard weight, genuine black wrought iron pipe with flanged cast iron fittings, except as otherwise indicated on the drawings. The silencer shall be similar and approved equal to Model M-30 as manufactured by the Maxim Silencer Co. The silencer shall be equipped with removable bronze drain plugs.

l. Insulation. - The entire exhuast assembly within the buildings including the flexible connection, shall be insulated with two one-inch thicknesses of insulation conforming to Federal Specification HH-I-523a, "(Insulation Block, Pipe Covering, and Cement, Thermal, Calcium Silicate) (For Temperatures up to 1200°F.)". The insulation shall be installed with staggered joints and with an 8-ounce canvas jacket.

23-04. GENERATOR. - a. General. - The generator shall be of the standard rotating field, synchronous type having the rating specified in Paragraph 23-02a. When the generator is operating continuously at full-rated load and voltage, the temperature rise in the cores and windings shall not exceed 50° C. with Class A insulation or 70° C. with Class B insulation above an ambient temperature of 40° C. The generator shall conform to the standards of the American Institute of Electrical Engineers and the National Electrical Manufacturer's Association. It shall be a regularly manufactured type and model of a make that has been regularly manufactured for at least 5 years. Generator and exciter shall be of open dripprooof type construction. Winding insulation for both shall be Class A or Class B. The armature terminals shall be located as shown on the drawings, and shall be housed in a terminal box with a removable cover, to which conduit may be readily connected from below.

b. Bearings. - The generator shall be provided with two sleeve- or ball-bearings of ample size. The bearings shall be phosphor bronze or bronze extending into an oil reservoir.

c. Slip Rings. - Slip rings shall be of bronze or brass. Brush holders shall be of rugged construction, marine type, and shall be capable of adjustment and of being locked in position.

23-05. EXCITER. - The exciter shall be mounted on an extension of the generator and bracket, and shall be direct-connected to the generator. The exciter shall be shunt-wound and of sufficient capacity to afford proper excitation of the generator field coils at 110 percent of the generator rating. The terminal voltage shall be 62-1/2 or 125 volts d.c. A rehostat shall be furnished for the exciter field and shall be of the rotary type, suitable for mounting on the back of the power switchboard, with the controls extending through to the front of the switchboard. A field discharge resistor of proper size shall be furnished for mounting on the switchboard.

23-06. FUEL OIL STORAGE TANK AND PIPING. - a. Piping. - A fuel-oil storage tank together with fill and vent pipe and supply piping, shall be provided and shall be of the size shown on the drawings. The fuel tank shall be welded-steel construction of not less than 3/16-inch steel and shall bear the label of the Underwriters' Laboratories, or a certificate from a nationally recognized testing laboratory that the tank has been tested and conforms to the applicable standards of the Underwriters' Laboratories will be acceptable. The fuel-oil piping between fuel-oil storage and the day tank and diesel engine, shall be copper tubing conforming to Federal Specification WW-T-799a, "Tubing, Copper, Seamless (For Use with Solder-Joint or Flared-Tube Fittings)", Type K, soft, installed with flared fittings. Connections at the engine shall be made with flexible base connections. The fill and vent pipes shall be galvanized steel pipe. A lock fill cap shall be provided with watertight fill box for the tank, shall be installed where shown on the drawings. The fuel gage and painting of the tank shall conform to the requirements of Paragraph 36-07d.

b. Fuel Oil Starting Tank. - Provide an install a fuel oil starting tank of capacity indicated on the drawings. Bracket to wall adjacent to fuel oil pumps. Tanks shall be tested to 5 p.s.i. with outlets suitably plugged.

c. Fuel Oil Transfer Pump. - Provide and electrical fuel oil transfer pump of a capacity shown on the drawings. Pump shall be self-priming, positive displacement, internal gear rotary type with mechanical seal with built-in by-pass relief valve, and shall be suitable for taking suction from the fuel oil storage tank. Pump shall be direct-driven or close-coupled to driving motor and all rotating external members shall be adequately guarded to prevent injury to operating personnel. Pump shall be controlled by the automatic starting equipment.

d. Hand-Operated Fuel Pump. - Provide and install a hand-operated fuel pump of internal gear type having a capacity as shown on the drawings. Pump shall be suitable for taking suction from the fuel oil storage tank and shall be self-priming and free from air binding when handling No. 2 Diesel fuel oil. Pump shall be bracketed to wall in a position of easy access and to permit uninterrupted and unobstructed operation.

e. Flow Indicator. - Indicator shall be of the double port type with removable screwed caps and glass port windows and shall be made of brass or bronze with inside threaded ends.

23-07. INSTALLATION. - All work shall be neatly and accurately done and shall be in accordance with the highest standards of practice for equipment of the type to be furnished, and the National Board of Fire Underwriters' Pamphlets Nos. 31 and 37. The engine and generator shall be accurately alined on the bed plate and securely attached thereto. Lifting eyes shall be provided for lifting the engine and generator, each separately, and the entire unit complete. The set shall be erected accurately to line and level, thoroughly secured, and every detail of the work of installation shall be done in a thorough, workmanlike manner. A heavy wood frame template shall be provided to guarantee proper location of anchor bolts. All bolts shall be set in pipe sleeves to permit lateral movement. Vibration dampers shall be provided under the engine supports to minimize the transmissions of vibrations to surrounding structures.

23-08. PAINTING. - The engine-generator set shall be painted in the shop in the most thorough manner to prevent corrosion, and in accordance with the manufacturer's standard practice. The engine-generator set shall be given a shop coat of machinery enamel, color as directed. Field painting of engine-generator set, storage tank, etc., shall be as specified in Section, PAINTING.

23-09. FIELD TESTS. - Following complete installation, the standby unit shall be field tested by the contractor and in the presence of the Contracting Officer as follows:

a. The unit shall be operated for 1/2 hour at rated speed and voltage at no load, during which test period the unit and auxiliary equipment shall be observed for vibration, checked for heating of bearings and electrical equipment, etc., and general performance.

b. After any required adjustments have been made, the engine generator units shall be tested as follows with readings taken once each 15 minutes. The field test shall consist of continuous operation as follows:

1 hour at 1/2 rated capacity immediately followed by

1 hour at 3/4 rated capacity immediately followed by

2 hours at full rated capacity immediately followed by

2 hours at 110 percent rated capacity.

The test data which shall be recorded during the field test shall include the following:

1. Time
2. Load in kw
3. Ambient temperature
4. Temperature of jacket water leaving engine
5. Lubricating oil pressure
6. Scavenging air or supercharger discharge pressure (where applicable)
7. A. C. volts
8. A. C. amperes
9. Power factor
10. Frequency

c. Proper correction of any defective equipment or improper installation shall be made and the entire test or any portion of it, as determined by the Contracting Officer, shall be repeated and satisfactorily completed.

d. During the field tests, the engine shall operate smoothly without objectionable noise or vibration; the governor shall maintain an even speed at all loads; and the electrical equipment shall operate with a constant steady voltage at all loads without any indication of excessive heating.

e. The valves on the engine cooling system shall be properly adjusted and permanently set.

f. The contractor shall furnish all instruments, test equipment, electrical load and personnel that are required for the tests.

23-10. GUARANTY. - The engine-generator unit furnished under these specifications shall be guaranteed in accordance with the guarantee provisions of the SPECIAL CONDITIONS.

23-11. PAYMENT. - a. Payment for designing, furnishing and installing and testing the diesel engine generator set for the Flood Control

Gate Shaft complete as specified, will be made at the contract price for Item 81, "Diesel-Electric Generator Set", which price shall include the fuel storage tank piping, sleeves, exhaust piping and all accessories.

b. Partial payment of 50 percent of the contract price will be made when the equipment has been shop tested to the complete satisfaction of the Contracting Officer and delivered complete at the site of the work.

c. Final payment will be made after the field tests are completed to the satisfaction of the Contracting Officer in accordance with Paragraph 23-09.

SECTION 24

VENTILATING SYSTEM, MECHANICAL
(INDEX)

Paragraph No.	Paragraph Title	Page No.
24-01	Scope	24-1
24-02	Applicable Specifications	24-1
	a. Federal Specifications	24-1
	b. National Association of Fan Manufacturers, Inc., Publication	24-1
	c. National Board of Fire Underwriters Pamphlets	24-1
24-03	General	24-1
	a. Standard Products	24-2
	b. Material and Equipment Schedule	24-2
24-04	Materials and Equipment	24-2
	a. Aluminum Sheets	24-2
	b. Asphalt Varnish	24-2
	c. Electrical Materials and Appliances	24-2
	d. Iron and Steel Sheets	24-2
	e. Mechanical Equipment	24-2
	f. Wire Screening	24-2
24-05	Workmanship	24-2
24-06	Fans	24-3
	a. Kitchen Fan	24-3
	b. Centrifugal Type	24-3
24-07	Vibration Absorbing Foundations	24-3
24-08	Goosenecks and Rain Hoods	24-4
24-09	Screens	24-4
24-10	Ductwork	24-4
24-11	Registers	24-5
24-12	Filters	24-5

Paragraph No.	Paragraph Title	Page No.
24-13	Dampers	24-5
24-14	Fan Control	24-5
24-15	Flexible Connections	24-5
24-16	Electrical Work	24-5
24-17	Painting and Finishing	24-5
24-18	Tests	24-6
24-19	Guaranty	24-6
24-20	Payment	24-6

SECTION 24

VENTILATING SYSTEM, MECHANICAL

24-01. SCOPE. - This section covers mechanical ventilating systems, complete.

24-02. APPLICABLE SPECIFICATIONS. - The following specifications and standards, of the issues listed below but referred to thereafter by basic designation only, form a part of this specification.

a. Federal Specifications. -

QQ-A-359d.	Aluminum Alloy Plate and Sheet 3003.
QQ-S-636.	Steel, Carbon (Low Carbon), Sheets and Strips.
QQ-S-775a.	Steel, Sheets, Carbon, Zinc-Coated.
RR-S-141a.	Screening, Wire, Insect.
TT-V-51a.	Varnish; Asphalt.
CCC-C-419.	Cloth, Duck, Cotton Unbleached Plied Yarns (Army and Numbered).

b. National Association of Fan Manufacturers, Inc., Bulletin. -

No. 110.	Standards, Definitions, Terms and Test Codes for Centrifugal, Axial and Propeller Fans.

c. National Board of Fire Underwriters Pamphlets. -

No. 90A.	Air Conditioning and Ventilating Systems of other than Residence Type (1955).
No. 91.	Blower and Exhaust Systems for Dust, Stock and Vapor Removal (1949).

24-03. GENERAL. - The contract drawings indicate the extent and general arrangement of the ventilating system. The contractor shall be responsible for assuring that his proposed system can be installed as indicated on the drawings without violation of applicable codes, standards, or specification requirements. If any departures from the contract drawings are deemed necessary by the contractor, details of such departures and the reasons therefor shall be submitted as soon as practicable to the Contracting Officer for approval. No such departures shall be made without the prior written approval of the Contracting Officer.

a. Standard Products. - The equipment to be furnished under this specification shall be essentially the standard product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer.

b. Material and Equipment Schedule. - As soon as practicable and within 30 days after date of award of contract and before commencement of installation of any materials or equipment, a complete schedule of materials and equipment proposed for installation shall be submitted in quintuplicate for the approval of the Contracting Officer. The schedule shall include catalogs, cuts, diagrams, drawings, and such other descriptive data as may be required by the Contracting Officer. In the event any items of materials or equipment contained in the schedule fail to comply with the specification requirements, such items may be rejected.

24-04. MATERIALS AND EQUIPMENT. - Materials and equipment shall conform to the respective specifications and other requirements specified below.

a. Aluminum Sheets. - Federal Specification QQ-A-359, quarter hard condition.

b. Asphalt Varnish. - Federal Specification TT-V-51.

c. Electrical Materials and Appliances. - ELECTRICAL WORK, INTERIOR, of these specifications.

d. Iron and Steel Sheets. - Iron and steel sheets, other than for registers and grilles, shall conform to Federal Specification QQ-S-775, Class D1. Steel sheets for registers and grilles shall conform to Federal Specification QQ-S-636, condition and finish standard with the manufacturer.

e. Mechanical Equipment. - Major items of mechanical equipment shall be of the best quality used for the purpose in commercial practice, and shall be the products of a reputable manufacturer. Each major component of the equipment shall have the manufacturer's name, address, and catalog number on a plate securely affixed in a conspicuous place. The name plate of a distributing agent only will not be acceptable. Belts, pulleys, chains, gears, couplings, projecting set screws, keys, and other rotating parts, located so that any person may come in close proximity thereto, shall be fully enclosed or properly guarded.

f. Wire Screening. - Federal Specification RR-S-141, Type I, II, or VII.

24-05. WORKMANSHIP. - Equipment shall be installed in accordance with the recommendations of the manufacturer and the best standard practice for this type of work.

24-06. FANS. - a. Kitchen Fan. - Kitchen fan for Operator's Quarters shall be installed where shown on the drawings. The fan and motor shall be designed for ceiling mounting. The fan shall be complete with ceiling grille and wall discharge cap containing back draft damper. The motor shall be designed to suit the characteristics of the available electric service and be provided with a manual control switch, located where indicated on the drawings or where directed by the Contracting Officer. Thermal overload protection shall be provided in the starter or integral with the motor. The fan shall be rated in accordance with Bulletin No. 110 of the National Association of Fan Manufacturers, Inc. The fan shall have a capacity not less than that shown on the drawings.

b. Centrifugal Type. - Centrifugal type fan units, complete with motors, drive equipment, and vibration isolation supports, shall be installed where shown on the drawings. The fans shall have air capacities not less than those shown on the drawings when operating against the static pressures indicated, and shall be rated and constructed in accordance with Bulletin No. 110 of the National Association of Fan Manufacturers, Inc. The impeller wheels shall be of the multiblade type, with curved blades, shall be heavily and rigidly constructed, accurately balanced both statically and dynamically, and free from objectionable vibration or noise. The bearings shall be self-alining and self-oiling, with adequate oil reservoirs. The fan shafts shall be of steel, and shall be provided with key seats and keys for the impeller hubs and fan pulleys. Each fan outlet shall be of ample proportions and shall be equipped with removable angles and bolts for attaching canvas or other flexible connections. Fans with wheel diameters of 12 inches or less shall be directly connected to the driving motor, and fans of larger wheel diameter shall be indirectly connected by means of an approved multiple V belt drive designed for at least 50 percent overlaod capacity. Where indirect drives are employed, motors shall be equipped with adjustable bases or with rails. Each motor shall be designed to suit the characteristics of the available electric service, and shall be provided with a starter, a remote control station, and a pilot indicating light, located where indicated on the drawings or where directed by the Contracting Officer. Thermal overload protection shall be provided in the starter or integral with the motor. Fans shall be so located and arranged as to afford ready access for repairs, cleaning, inspection, and lubrication. Where indicated on the drawings, fan shall be of non-sparking construction.

24-07. VIBRATION ABSORBING FOUNDATIONS. - Vibration absorbing foundations shall isolate the centrifugal-type fan units from the building structure. Each foundation shall consist of an adequate number of standard isolation units, each consisting of machine and floor fastenings, together with intermediate isolation material. The units shall be standard catalog products with printed loading ratings.

24-08. GOOSENECKS AND RAIN HOODS. - Goosenecks and rain hoods shall be constructed of galvanized iron or steel sheets of approved weight, and shall be rigidly reinforced and braced, and flashed in an approved manner.

24-09. SCREENS. - Removable bird and insect screens shall be installed in the fresh air inlet to fallout shelter and in the goosenecks and rain hoods. Insect screens shall be 16-mesh wire screening, and bird screens shall be 1/2-inch mesh galvanized hardware cloth.

24-10. DUCTWORK. - Ductwork shown on the drawings, specified, or required for the mechanical ventilation systems shall be constructed and erected in a first class workmanlike manner. The ductwork shall be constructed of galvanized iron or steel sheets or of aluminum sheets. Ducts, unless otherwise approved, shall conform accurately to the dimensions indicated on the drawings, and shall be straight and smooth on the inside, with joints neatly finished. Ducts shall be anchored securely to the building in an approved manner and shall be installed so as to be completely free from vibration under all conditions of operation. Curved elbows shall have a centerline radius not less than 1-1/2-times the width of the duct. Air turns shall be installed in abrupt elbow. The air turns shall consist of curved metal blades or vanes, arranged so as to permit the air to make the abrupt turns without appreciable turbulence, shall be the manufacturer's standard products, and shall be quiet and free from vibration when the system is in operation. Sheet metal ducts shall be properly braced and reinforced with galvanized steel angles or other approved structural members. Unless otherwise required, the internal ends of slip joints shall be installed in the direction of flow. Unless otherwise specified, the sheet metal ducts and stiffeners shall conform to Table I. Sheet metal work required in connection with kitchen system shall conform to the National Board of Fire Underwriters' Pamphlet No. 91.

Table I. Sheet-metal thickness for rectangular duct construction

Aluminum thickness (inch)	Galv. Sheet gage	Maximum size (inches)	Type of transverse joint connections	Bracing
0.20	26	Up to 12	S, drive, pocket, or bar slips on 7-ft., 10-in. centers	None
		13 to 24	S, drive, pocket, or bar slips on 7-ft., 10-in. centers.	None
0.025	24	25 to 30	S, drive, 1-in pocket or 1-in. bar slips on 7-ft., 10-in. centers.	1 x 1 x 1/8 angles 4 ft. from joint.

24-11. REGISTERS. - Registers shall be the four-way directional control type with face-operated opposed-blade volume-control damper. Registers shall have flanged face and shall be provided with sponge-rubber gasket between flange and duct. The four-way control shall be by adjustment of the horizontal and vertical vanes.

24-12. FILTERS. - Filters for the air supply system to the fallout shelter room shall be panel-type renewable media and shall have 2-inch thick glass-fiber, cellulose-fiber, cotton-linter, or synthetic fiber media pad enclosed in sectional frames of not less than 16-gage galvanized steel and equipped with quick-opening mechanism for changing filter media. The media shall have an efficiency of not less than 70 percent when tested in accordance with the Dust Spot Test Method using Cattrell precipitate as developed by the National Bureau of Standards.

24-13. DAMPERS. - The fresh air and return air dampers for the supply air system to the fallout shelter room shall be of the motorized multilouver parallel-blade type. The dampers shall be factory fabricated with galvanized blade, oil-impregnated bearings, and channel-iron frames with rust-inhibitor treatment, and shall be suitable for mounting in ductwork. Damper blades shall be not lighter than 16-gage (0.0653 inch in nominal thickness) steel and shall have interlocking edges. Dampers shall be of the two-position type.

24-14. FAN CONTROL. - The supply fan for the fallout shelter room shall be controlled by a three-position switch. With the switch placed in the first position the fan shall be deenergized, the fresh air damper shall be closed, and the return air damper shall be wide open. With the switch in its second position the fan shall be energized, the fresh air damper shall be closed, and the return air damper shall be wide open. Placing the switch in its third position shall energize the fan, open the fresh air damper, and close the return air damper.

24-15. FLEXIBLE CONNECTIONS. - Flexible connections for preventing the transmission of vibration through the ducts, shall be installed between suction and discharge openings in centrifugal fan housings and the ducts with which they are connected. The material used shall be glass, asbestos, or other approved fire resistant fabric. The flexible material shall be furnished with all necessary angles, bolts, clips, or other fastenings for securing it to the fans or adjoining ducts.

24-16. ELECTRICAL WORK. - All manual or automatic control and protective or signal devices required for the operation of the equipment herein specified and any wiring required but not indicated on the electrical plans shall be furnished and installed under this section of the specifications. Wiring shall conform to ELECTRICAL WORK, INTERIOR.

24-17. PAINTING AND FINISHING. - Duct hangers and other exposed and unprotected ferrous metal external to finished rooms shall be thoroughly cleaned and given one coat of asphalt varnish. Fan housing external to finished rooms shall be thoroughly cleaned and given two coats of machinery enamel in a color selected by the Contracting Officer. The painting of fan units, roof ventilators, grilles, registers, and ferrous metal work exposed within finished rooms, is covered under PAINTING. Except where provided with a protective primer at the factory, all ferrous metal specified to receive finish painting shall be primed as specified in PAINTING.

24-18. TESTS. - Upon completion, and prior to acceptance of the installation, the contractor shall subject each ventilating fan to such operating tests as may be required by the Contracting Officer to demonstrate satisfactory functional and operating efficiency. Operating tests shall cover a period of not less than 6 hours for each system, and all tests shall be conducted at such times as the Contracting Officer may direct. All instruments, facilities, and labor required to properly conduct the tests shall be provided by the contractor at no additional cost to the Government, and all electricity required will be furnished by the Government.

24-19. GUARANTY. - The following equipment to be furnished under this section of the specifications shall be guaranteed in accordance with the guarantee provisions set forth in the SPECIAL CONDITIONS.

Damper motors
Kitchen fans
Centrifugal type fans
Controls

24-20. PAYMENT. - a. No separate payment will be made for the work covered under this section in connection with the Utility Building and the Operator's Quarters, and all costs in connection therewith shall be included in the applicable lump sum contract prices for the structures to which the work pertains.

b. No separate payment will be made for the work under this section in connection with the Flood Control Operating Tower and all costs in connection therewith shall be included in the contract lump sum price for Item 78, "Heating and Ventilating Systems - Flood Control Operating House".

SECTION 25

ELECTRICAL WORK, INTERIOR

INDEX

Paragraph No.	Paragraph Title	Page No.
25-01	Scope	25-1
25-02	General	25-1
	a. Standard Products	25-1
	b. Materials and Equipment Schedules	25-1
25-03	Standard Rules and Specifications	25-2
25-04	Grounding	25-2
	a. Water Supply Tower and Flood Control Gate Shaft	25-2
	b. Operator's Quarters and Utility Building	25-3
	c. Lightning Protection System	25-3
25-05	Wiring	25-3
25-06	Insulated Wire and Cable	25-3
	a. General	25-3
	b. Materials, Construction, and Tests	25-4
	c. Conductors	25-4
	d. Insulation	25-4
	e. Jackets	25-5
	f. Dimensional Tolerances	25-5
	g. Approval	25-5
	h. Inspection and Tests	25-5
	i. Mineral-Insulated Cable System	25-5
	j. Interior Wiring	25-6
	k. Lighting Fixture Wire	25-6
25-07	Conduit Systems	25-6
	a. Water Supply Tower and Flood Control Gate Shaft	25-6
	b. Utility Building and Operator's Quarters	25-6
	c. Installation	25-6
25-08	Non-Metallic Sheathed Cables	25-7
25-09	Outlets	25-7

Paragraph No.	Paragraph Title	Page No.
	a. Pull Boxes	25-8
	b. Clock outlets	25-8
	c. Telephone Outlets	25-8
	d. Device Plates	25-8
25-10	Wall Receptacles	25-9
	a. Duplex Convenience Receptacles	25-9
	b. Range Receptacles	25-9
	c. Power Receptacles	25-9
	d. Floodlight Receptacles	25-9
25-11	Wall Switches	25-9
25-12	Multibreaker Load Center	25-10
25-13	Panelboards	25-10
25-14	Cabinets	25-10
	a. Panelboard Cabinets	25-10
25-15	Fixtures	25-10
	a. Floodlights	25-10
	b. Type "L" Fixtures	25-11
25-16	Service Equipment and Disconnected Devices	25-11
	a. Circuit Breakers	25-11
	b. Safety Switches	25-11
25-17	Fuses	25-11
	a. Plug Fuses	25-11
	b. Cartridge Fuses, Dual Element Time Lag Type	25-12
25-18	Lighting Transformers	25-12
	a. Type and Rating	25-12
	b. Construction	25-12
	c. Full Capacity Taps	25-12
	d. Approval Data	25-12
25-19	Control Center	25-12
	a. General	25-12
	b. Construction	25-12
	c. Buses	25-13
	d. Space Heaters	25-13
	e. Fused Switches	25-14
	f. Motor Starters	25-14
	g. Transfer Switch	25-14

Paragraph No.	Paragraph Title	Page No.
	h. Wiring	25-15
	i. Name Plates	25-15
	j. Indicating Instruments	25-15
	k. Rectifier	25-16
	l. Generator Voltage Regulator	25-16
	m. Rubber Matting	25-16
	n. Painting	25-17
	o. Factory Assembly and Tests	25-17
25-20	Door Bell System	25-17
25-21	Nameplates	25-18
25-22	Motors	25-18
	a. Fractional-Horsepower Motors	25-18
	b. Integral-Horsepower Motors	25-18
25-23	Motor Control	25-18
25-24	Motor Disconnect Means	25-19
25-25	Equipment Connections	25-19
25-26	Tests	25-19
25-27	Guarantee	25-20
25-08	Payment	25-20

SECTION 25

ELECTRICAL WORK: INTERIOR

25-01. SCOPE. - This section covers the interior electrical systems, complete.

25-02. GENERAL. - The installations shall comply with the applicable rules and specifications listed below except where otherwise noted on the drawings or specified herein. All electrical materials shall be new and as approved by the Underwriters' Laboratories, Inc., or equivalent statement, except as otherwise specified herein. Defective equipment or equipment damaged in the course of installation or test shall be replaced or repaired in an approved manner. Lamps shall be furnished and installed by the contractor. The drawings indicate the extent and general arrangement of the conduit and wiring systems. If any departures from the drawings are deemed necessary by the contractor, details of such departures and the reasons therefor shall be submitted for approval as soon as practicable, and within 30 calendar days after date of receipt by him of notice to proceed. No such ddepartures shall be made without prior written approval. See Dwg. No. 40-06-04, sheet 1 attached at end of this section, relative to electrical symbols.

a. Standard Products. - Except as herein specified, the materials to be furnished under this specification shall be the standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design.

b. Materials and Equipment Schedules. - (1) As soon as practicable and within 120 calendar days after the date of receipt by him of notice to proceed before any materials, fixtures, or equipment are purchased, the contractor shall submit for approval a complete list, in six copies, of materials, fixtures, and equipment to be incorporated in the work. The list shall include catalog numbers, cuts, diagrams, drawings, and such other descriptive data as may be required. No consideration will be given to partial lists submitted from time to time. Approval of materials will be based on manufacturers' published ratings. Any materials, fixtures and equipment listed which are not in accordance with the specification requirements may be rejected.

(2) The contractor shall submit, within 120 calendar days of date of receipt by him of notice to proceed, detailed dimensioned drawings and data descriptive of all equipment powered by electric motors, switchboard and all its equipment, controls, lighting distribution panelboards, lighting fixtures, conduits, wire and accessories which he proposes to install and dimensioned conduit layouts of floor slabs for approval. No floor with embedded conduits shall be placed until

the contractor has received approval of this conduit layout from the Contracting Officer. The contractor will be held responsible for any delay in the placing of the floors with embedded conduits, should he fail to submit equipment data and required drawing within the time specified above.

25-03. STANDARD RULES AND SPECIFICATIONS. - a. Unless otherwise specified, all electrical equipment and materials, workmanship and tests shall conform with the current standard rules, regulations and specifications of the following authorities.

(1) American Institute of Electrical Engineers, 33 W. 39th Street, New York, New York.

(2) National Board of Fire Underwriters, National Electrical Code, 85 John Street, New York, N.Y.

(3) National Electrical Safety Code.

(4) National Electrical Manufacturers Association, 155 East 44th Street, New York, N.Y.

(5) Federal Specifications cited herein, (Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.)

b. Copies of these rules, regulations and specifications may be procured at the addresses as given, or may be seen at the Corps of Engineers Office, Waltham, Mass.

c. Options of the Government. - If the contractor fails to submit for approval, within the specified time, a list of materials, and fixtures and equipment in accordance with the preceding paragraphs, the Contracting Officer will select a complete list of materials, fixtures and equipment. The selection made by the Contracting Officer shall be final and binding and the items shall be furnished by the contractor without change in contract price or time of completions.

25-04. GROUNDING. - a. Water Supply Tower and Flood Control Gate Shaft. - The frame of the control center, generator, all metal cabinets enclosing electrical equipment and all conduits shall be effectively bonded and grounded as herein specified. All conduits at the control center shall be bonded together with a No. 6 copper cable, using standard grounding bushings for this purpose. The control center frame and 120/240 V neutral shall be grounded to this conduit ground system. A grounding conductor shall be installed in the conduit between the control center and the generator. Where conduits enter cabinets, switches, controllers, etc., other than those with cast iron enclosures, they shall be provided with standard grounding bushings which shall be used to effectively ground the conduit to the metal enclosures. The use of locknuts and bushings will not be acceptable as a means of grounding conduit to enclosures.

b. Operator's Quarters and Utility Building. - The neutral conductor of the wiring systems and service entrance equipment in the Operator's Quarters and Utility Building shall be grounded to the water service with a No. 8 bare cable at a point as near as practicable to the water service entrance. Connection to water service shall be made using approved ground clamp. The ground wire shall be protected by 1/2-inch conduit.

c. Lightning Protection System. - Air terminals shall be located at the top of the Water Supply Tower and Flood Control Gate Shaft Structures as shown on the drawings, and down leads on the exterior of the structure will provide a direct connection to earth. The earth terminal shall consist of three 3/4- inch by 20-foot copper weld ground rods driven in undisturbed earth 20 feet apart in triangular formation in the river bed approximately 150 feet upstream from the structures bases. If ground rods cannot be used because of rock formation, contractor shall refer this item to Contracting Officer. Connection between structures and ground rods shall be made by 4/0 weatherproof copper conductor buried in the earth or fastened to exposed rock at 5 foot intervals by means of expansion sleeves and cable clips. The lightning protection system shall conform to the requirements of NBS handbook H-46.

25-05. WIRING. - Branch-circuit conductors shall be not smaller than No. 12 a.w.g. Conductors for signal and pilot control circuits may be No. 14 a.w.g. Conductors shall be continuous from outlet to outlet and no splices shall be made except within outlet or junction boxes; junction boxes may be utilized where required. Wire connectors with moulded insulating material or solderless pressure connectors, properly taped, shall be utilized for all splices in wiring. Soldered joints insulated with tape shall be kept to a minimum. Rubber and friction tape shall conform to the requirements of Federal Specifications HH-T-111c HH-T-101a respectively. Vinyl plastic tape will be acceptable in lieu of rubber and friction tape.

25-06. INSULATED WIRE AND CABLE. - a. General. - (1) Except for control center wiring or unless otherwise specified, all wire and cable for power, control and lighting systems shall be single conductor cables, insulated as specified below with either a heat and moisture-resisting or an ozone-resisting grade of insulation and with heavy duty oil resistant thermosetting synthetic compound (Neoprene) jackets, all conforming to the specific requirements specified below.

(2) The conductor size and circuit operating voltage for any particular application or service shall be as listed in the cable tabulation, as indicated on the drawings, or as specified under the detailed requirements for the particular item.

b. Materials, Construction, and Tests. - Materials, construction, and tests unless otherwise specified, shall conform to the applicable requirements of the IPCEA-NEMA Standards Publication No. WC 3-1959, March 1959, entitled "Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy". Parts, sections, appendices, grades and classes specified hereinafter will refer to the above IPCEA-NEMA Standard, unless otherwise stated.

c. Conductors. - Conductors shall be of tin or lead alloy coated annealed copper wire conforming to all the applicable requirements of Part 2. Conductors shall be solid or stranded as required below.

(1) Power and Lighting Circuits. - (a) Conductors. - Conductors to be insulated for 1000-volt service and below shall have Class B stranding.

(2) Control Circuits. - Conductors shall have Class B or Class C stranding and shall be not smaller than No. 12 AWG.

d. Insulation. - (1) Material. - Conductor insulation shall be suitable for conductor temperature of not less than 75°C, and, for conductors specified to be insulated for Rated Circuit Voltage of 600 volts and less, shall be either a vulcanized "Synthetic rubber Heat and Moisture Resisting" grade of insulation or an "Ozone-Resisting Natural or Synthetic Rubber" grade of insulation; and, for conductors specified to be insulated for a Rated Circuit Voltage of 601 volts and greater, shall be an "Ozone-Resisting Natural or Synthetic Rubber or Butyl Rubber" grade of insulation. The "Ozone Resisting" grade of insulating compounds shall conform to the requirements of Paragraphs 3.14 or 3.15, except that water absorption characteristics of the Ozone-Resisting Natural or Synthetic Rubber Grade of insulation (3.14) shall be as follows:

The compound, after a 24-hour immersion, shall show a specific inductive capacity not greater than 4.5; and, after a continuous 14-day immersion, shall show a specific inductive capacity not more than 7 percent higher than the value determined at the end of the initial 24-hour period, nor more than 3 percent higher than at the end of the seventh day. The "Synthetic Rubber, Heat and Moisture Resisting" grade of insulating shall conform to the requirements of Paragraph 3.13, except that the specific inductive capacity and mechanical water absorption characteristics shall be as follows:

The compound, after a 24-hour immersion, shall show a specific inductive capacity not greater than 5; and, after a continuous 14-day immersion, shall show a specific inductive capacity not more than 10 percent higher than the value determined at the end of the initial 24-hour period; nor more than 3 percent higher than at the end of the seventh day.

The compound, after a 7-day immersion, shall not absorb more than .015 grams of water per square inch of surface exposed to the water.

The manufacturer, in the presence of the Contracting Officer, shall perform tests on samples of the insulation taken from the finished product to determine compliance with the specified requirements. Test procedure shall be in accordance with the applicable requirements of ASTM Standard D470-58T, entitled "Testing Rubber nand Thermoplastic Insulated Wire and Cable".

(2) Insulation Thickness. - Thickness of conductor insulation shall be not less than that shown in Part 3, Table 12, ungrounded neutral, for the respective Rated Circuit Voltages.

e. Jackets. - Over the insulated conductor there shall be applied an outer jacket of an oil-resisting thermosetting synthetic compound conforming to Part 4, paragraph 4.13.3. Except for shielded wires and cables, the jacket shall be in direct contact and adhere to the conductor insulation. If nonshielded, the jacket thickness shall be as specified in Part 4, Table 26. If shielded, the jacket thickness shall be in accordance with the requirements of Table 28 of the above reference.

f. Dimensional Tolerance. - The outside diameter of single conductor wires and cables and multiple-conductor cables shall not vary more than 10 percent and 5 percent, respectively, from the calculated outside diameter based on the thickness, including tolerance, of the component materials specified.

g. Approval. - Manufacture of the wire or cable shall not be started until all materials to be used in the fabrication of the finished wire or cable have been approved by the Contracting Officer.

h. Inspection and Tests. - (1) General. - Inspection and tests of wire and cable furnished under these specification shall be made by and at the plant of the manufacturer, and shall be witnessed by the Contracting Officer, unless waived in writing. All tests and inspections shall conform to the procedure set forth in the applicable specifications or standards referred to herein.

(2) Reports. - Six certified copies of test reports, indicating the results of tests made, shall be furnished the Contracting Officer, and no wire or cable shall be shipped until authorized by the Contracting Officer.

i. Mineral-Insulated Cable System. - Mineral-insulated cable system, type MI shall be furnished and installed in the Water Supply Tower and Flood Control Gate Shaft areas below Elev. 584, in lieu of exposed conduit wiring. MI cable shall be rated at 600V. Cables shall be fastened within 12 inches of each turn or offset and at intervals of not more than 6 feet. Cable terminations shall be carefully made in accordance with manufacturer's recommendations immediately upon stripping of sheath.

j. Interior Wiring. - Interior wiring for the Utility Building and Operator's Quarters, including the Garage, shall be non-metallic sheathed cable, containing a grounding conductor. In the heater room and other locations designated on the drawings where conduit or tubing is to be installed, the wiring shall be single conductor, copper, 600V rubber insulated and shall meet the requirements of Paragraph 25-06a or shall be code grade with neoprene jacket.

k. Lighting Fixture Wire. - Lighting fixture wire within the Water Supply Tower and Flood Control Gate Shaft including leads to equipment heaters and non-portable heating devices shall be single conductor, stranded copper, 600V silicone rubber insulated, with glass braid outer covering, as listed by Underwriters' Laboratories, Inc. Lighting fixture wire within the Garage, Utility Building, and Operator's Quarters where required shall be single conductor, stranded copper 300V type AF.

25-07. CONDUIT SYSTEMS. - a. Water Supply Tower and Flood Control Gate Shaft. - The conduit system shall be installed in accordance with the applicable provisions of the National Electrical Code. Cast metal conduit boxes for threaded conduit connection, shall be used. Rigid galvanized steel conduit conforming to Federal Specification WW-C-581c shall be used. Conduit fittings, including supports, shall be of cast or malleable iron conforming to Federal Specification W-F-406. Conduit shall be of 3/4-inch minimum size except as noted.

b. Utility Building and Operator's Quarters. - Non-metallic sheathed cable without conduit shall be used generally. At locations where conduit or tubing is to be installed, it shall be installed in accordance with the applicable provisions of the National Electrical Code. Rigid steel conduit shall be zinc coated and shall conform to requirements of Federal Specification WW-C-581c. Electrical metallic tubing shall be zinc coated and shall conform to requirements of Federal Specification WW-T-806b. Conduit fittings shall conform to the requirements of Federal Specification W-F-406. Conduit shall be of 1/2-inch minimum size.

c. Installation. - Conduits shall be concealed within the walls, ceilings and floors where possible, and shall be kept at least 6 inches from parallel runs of flues, steam pipes or hot-water pipes unless otherwise shown on the drawings. Exposed runs of conduit shall have supports spaced not more than 8 feet apart and shall be installed with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings, with right-angle turns consisting of cast-metal fittings or symmetrical ends. Bends and offsets shall be avoided where possible, but where necessary shall be made with an approved hickey or conduit-bending machine. Conduit which has been crushed or deformed in any way shall not be installed. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure conduit supports. Conduit shall be supported on approved types of wall brackets, ceiling trapeze, strap hangers, or pipe straps, secured by means of toggle bolts on hollow masonry units, expansion bolts in concrete or brick, machine screws on metal surfaces, and wood screws on wood construction. Threaded studs driven in with a powder charge are permitted for fastening raceways on solid masonry, steel, concrete and wood. Threaded studs welded to steel are acceptable. Nails shall not be used as the means of fastening boxes or conduits. Conduit shall be installed in such manner as to insure against trouble from the collection of trapped condensation, and all runs of conduit shall be arranged so as to be devoid of traps wherever possible. The contractor shall exercise the necessary precautions to prevent the lodgement of dirt, plaster, or trash in conduit, tubing, fittings, and boxes during the course of installation. A run of conduit which has become clogged shall be entirely freed of these accumulations or shall be replaced. Conduit shall be securely fastened to all sheet-metal outlet, junction, and pull boxes with galvanized locknuts and bushings, care being observed to see that the full number of threads project through to permit the bushing to be drawn tight against the end of conduit, after which the locknut shall be made up sufficiently tight to draw the bushing into firm electrical contact with the box. Double locknut construction shall be used. No. 14 soft drawn galvanized iron pull wire shall be installed in all telephone conduits.

25-08. NON-METALLIC SHEATHED CABLE. - Non metallic sheathed cable with a ground wire shall be installed in the Operator's Quarters and Utility building only in accordance with the applicable provisions of the National Electrical Code. Conductors shall be not less than No. 12 Non-metallic sheathed cables shall not be run exposed. For exposed work, insulated conductors in conduit or tubing shall be installed. Non-metallic sheathed cable shall be secured in place by means of properly sized cable straps or approved staples or other fittings. Supports shall be not more than 30 inches apart. Cable shall terminate with an approved type of connector at each outlet, unless the outlet embodies a means serving this purpose. Where 4 conductors are required, 2-2 conductor cables may be utilized. Conductors shall generally be installed over the tops or through ceiling joists or when this is impracticable, suitable running boards shall be provided as a supporting means. Care shall be taken at terminals or end supports to see that the insulation is not injuriously crimped or deformed. Non-metallic sheathed cable shall conform to the requirements of the Underwriters' Laboratories, Inc., Standard for Non-Metallic Sheathed Cable.

25-09. OUTLETS. - Outlets shall be installed in the locations shown on the drawings. The contractor shall study the general building plans in relation to the spaces surrounding each outlet in order that his work will avoid interference with the other work required by these specifications. When necessary, the contractor shall relocate outlets so that, when fixtures or other fittings are installed, they

//

will be symmetrically located according to room layout and will not interfere with other work or equipment. Only zinc coated or cadmium-plated sheet-steel boxes conforming to requirements of Federal Specification W-J-800a, of a class to satisfy the conditions for each outlet, shall be used in concealed work. Boxes shall be installed in a rigid and satisfactory manner, either by wood screws on wood, expansion shields on masonry, or machine screws on steel work. Threaded studs driven in with a powder charge are permitted for fastening boxes on solid masonry, steel, concrete and wood threaded studs welded to steel are acceptable. Fixture outlet boxes in concealed work on ceiling shall be not less than 4-inch octagonal. Fixture outlet boxes in concrete ceilings shall be of the 4-inch octagonal concrete type, set flush with the finished surface. Fixture outlet boxes, boxes on dry wall type ceiling construction shall be fitted with open covers set to come flush with the finished surface. Switch, telephone and receptacle outlet boxes shall be not less than 4 inches square for conduit or tubing, fitting with appropriate plaster covers, where necessary, to set flush with the finished surface. Device boxes suitable to accommodate nonmetallic sheathed cable shall be used for switch and receptacle outlets in the cable system. Outlets for exposed work and all outlets in the Water Supply Tower and the Flood Control Gate Shaft shall be of cast steel or alloy, fitted with appropriate covers. Cast-metal fittings shall conform to the requirements of Federal Specification W-C-586. Outlets and junction boxes less than 6" x 6" x 4" in exposed work shall be cast steel or alloy fitted with appropriate covers.

a. Pull Boxes. - Pull boxes of 6" x 6" x 4" and larger shall be constructed of code-gage galvanized sheet metal, of not less than the minimum size recommended by the National Electrical Code. Boxes shall be furnished with screw-fastened covers. Where several feeders pass through a common pull box, they shall be tagged to indicate clearly their electrical characteristics, circuit number, and panel designation.

b. Clock Outlets. - Each clock outlet shall consist of an outlet box, plaster cover where required, and single receptacle with brass clock-outlet plate. The receptacle shall be sufficiently recessed within the box to allow the complete insertion of a standard cap, flush with the plate. A suitable clip or support for hanging the clock shall be secured to the top of the plate.

c. Telephone Outlets. - Each telephone outlet shall be provided with 3/8-inch bushed hole in the center.

d. Device Plates. - A device plate shall be provided for each outlet to suit the device installed. All plates on unfinished walls or on fittings shall be of zinc-coated sheet metal having rounded or beveled edges. All plates on finished walls shall be stainless steel. Screws shall be of metal with countersunk heads, with finish to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted.

Plates shall be installed vertically and with an alinement tolerance of 1/16-inch. Device plates shall be one of the one-piece type, of suitable shape for the devices to be covered. The use of sectional device plates will not be permitted.

25-10. WALL RECEPTACLES. - Wall receptacles shall conform to the requirements of Federal Specification W-C-596, type and style as specified.

a. Duplex Convenience Receptacles. - Duplex convenience receptacles shall be grounding, series D type, 15 amperes, 125 volt rating.

b. Range receptacles. - Flush, molded-plastic, 50-ampere, 250-volt, 3-pole, 3-wire, range receptacles shall be series T. The receptacle shall be furnished with a flexible cord set, for connection to the electric range. The cord set shall consist of a 50-ampere, 250-volt, 3-pole, angle type, molded plastic cap with a 36-inch length of rubber-jacketed cable consisting of two No. 6 and one On. 8. a.w.g. conductors.

c. Power Receptacles. - Power receptacles shall be 600-volt, 30-ampere, 3-wire, 4-pole grounding type with matching plug.

d. Floodlight Receptacles. - Floodlight receptacles shall be 600-volt, 20-ampere, 2-wire, 2-pole weather resistant Crouse Hinds Catalog No. ARJ-13 Condulet with No. AR-227 housing, or approved equal. One No. ARJ2271 or approved equal plug shall be provided for each receptacle and connected on the floodlight attachment cord.

25-11. WALL SWITCHES. - Wall switches shall be of the totally enclosed brown handle tumbler type and shall conform to the requirements of Federal Specification W-S-896. Switches shall have screw type terminals or screwless pressure type having suitable conductor release arrangement. Enclosures shall be of phenolic composition. Not more than one switch shall be installed in a single gang position of a switch box. Single-pole, three-way and four-way switches shall be of the tumbler type, rated 15 amperes at 120 volts, AC only. All switches shall be suitable for the control of tungsten-filament lamp loads up to their full rated capacity. When switches with pilot lights are indicated on the drawings, the combinations shall consist of a switch, as specified above, and a yoke-mounted candelabra-base socket rated at 75 watts, 125 volts, and fitted with a glass or plastic jewel, mounted in a 2-gang box with a 2-gang plate. A clear 6-watt lamp shall be furnished and installed in each pilot switch. Jewels for use with switches controlling motors shall be colored green and for other purposes, red.

25-12. MULTIBREAKER LOAD CENTER. - Load center in Operator's Quarters, where noted on the drawings, shall be of the multibreaker type and shall have the number of branches of the ratings indicated on the drawings. The load center shall be enclosed in a code-gage, sheet-box with gray baked-enamel finish. The trim shall be recessed sufficiently to permit the breaker operating handles to protrude through the front for manual operation. Circuit breakers shall conform to the requirements of Federal Specification W-P-131a, Class B.

25-13. PANELBOARDS. - Panelboards shall be of the dead-front safety type. Unless otherwise indicated on the drawings, panelboards shall be provided with lugs only in the mains. Panelboards shall be provided with the size and number of single, double, or triple-pole branches as indicated on the drawings. Circuit-breaker-type panelboards shall conform to the requirements of Federal Specification W-P-131a, Class A, except that breakers shall have bolted type buss connection. Fusible-type panelboards shall conform to the requirements of Federal Specification W-P-146. Double- and triple-pole branches shall be of the hinged door type; single pole branches shall be of the tumbler-type switch-and-fuse unit. Switch-and-fuse units acting as motor circuit disconnects shall be horsepower-rated.

25-14. CABINETS. - Cabinet boxes shall be constructed of zinc-coated sheet steel and shall conform to the requirements of Underwriters' Laboratories, Inc. Standard for Cabinets and Boxes. Trims and doors shall have a suitable primer coat and finish coat of color specifically designated by the Contracting Officer.

a. Panelboard Cabinets. - Cabinets for panelboards shall be provided with not less than 4-inch wiring gutters at the sides, top and bottom. Cabinets shall be mounted so that the distance from the floor to the center of the top switch or circuit breaker will not exceed 6 feet 6 inches. Flush cabinets shall be provided with trims having adjustable trim clamps. Trims shall be fitted with hinged doors having a combination lock and latch. All locks shall be keyed alike. A directory holder with transparent plate and metal frame shall be mounted on the inside of each door. A neatly typed directory, properly identifying each circuit, shall be mounted under the plate.

25-15. FIXTURES. - The contractor shall provide all lighting fixtures as specified on the contract drawings, and as specified on the Corps of Engineers Drawing No. 40-06-04, Sheet 2, 3, 8, 9, 10, 11, 12, 18, 26, 28, 32, 33, 35, 42 and 45 attached at the end of this section. Auxiliaries for fluorescent fixtures shall comply with the requirements of Federal Specification W-B-30. Lamps shall be furnished and installed by the contractor. All fluorescent fixtures shall be provided with rapid start ballasts.

a. Floodlights. - Floodlights shall be 300-500 watt wide beam type with 16-inch diameter hinged cover. Glass shall be heat resisting type, ribbed for oval 70° x 90° spread. Unit shall be weatherproof and dust tight, and shall have a suitable mounting bracket. Unit shall be approved by Underwriters' Laboratories, Inc.

b. Type "L" Fixtures. - Type "L" fixtures as specified on the attached sketch dated 15 July 1959 shall be furnished and installed in the Structures in the inspection areas as indicated on the drawings.

25-16. SERVICE EQUIPMENT AND DISCONNECTING DEVICES. - Main service disconnecting means shall be equipped with an external lever or handle for manual operation. Each unit shall be enclosed in a code gage, sheet steel cabinet suitable for flush or surface mounting as indicated on the drawings. Flush-mounted enclosures shall have screw-fastened covers. Surface mounted inclosures shall have hinged doors and catches. Neutral connections shall be solid throughout. Disconnection switches and circuit breakers shall be installed as shown on the drawings.

a. Circuit Breakers. - Circuit breakers shall comply with the applicable requirements of Federal Specification W-P-131a, class as required.

b. Safety Switches. - Safety switches shall be of the fusible type and shall comply with the requirements of Underwriters' Laboratories, Inc., Standard for Service Equipment.

25-17. FUSES. - The contractor shall furnish a complete set of fuses for all switches, panels, and control center as required. Time-current-tripping characteristics of fuses serving motors or connected in series with circuit breakers shall be coordinated for the proper operation. Fuses shall have a voltage rating not less than the circuit voltage.

a. Plug Fuses. - Plug fuses shall be the nonrenewable time-delay type, and shall be used for circuits rated 125 volts or less and 30 amperes or less, conforming to the requirements of Federal Specification W-F-791, type II, style B.

b. Cartridge Fuses, Dual-Element Time-Lag Type. - Cartridge fuses, dual-element time-lag type, shall be nonrenewable with an interrupting rating not less than 10,000 amperes, conforming to the requirements of Federal Specification W-F-791, type I, style A. At 500 percent current, cartridge fuses shall not blow in less than 10 seconds. Cartridge fuses shall be used for circuits rated in excess of 30 amperes.

25-18. LIGHTING TRANSFORMERS. - a. Type and Rating. - Lighting transformers shall be furnished and installed as shown on the drawings. The transformer shall be for 60-cycle operation, shall have the phase, voltage and power rating specified on the drawings, and shall be the two-winding dry type, self-cooled. The transformers shall be designed to carry full rated load continuously without exceeding 80 degrees C. rise above an ambient temperature of 40 degrees C. when cooled by natural air circulation. While in service they shall be capable of withstanding without injury a short circuit on the secondary terminals with normal voltage maintained on the primary terminals provided the duration of this condition is at no time sufficient to cause injurious heating.

b. Construction. - Each transformer for independent mounting shall be rigidly attached to a suitable base and completely enclosed by a metal housing. Suitable removable lifting eye bolts or other approved means shall be provided for handling each transformer both with and without the housing.

c. Full Capacity Taps. - The lighting transformers shall be provided with two 5 percent full capacity taps below rated primary voltage. A terminal board and studs inside the transformer shall be provided as the means for changing the transformer tap connection made accessible by removal of a panel.

d. Approval Data. - Data to be submitted for approval before commencing manufacture shall include assembly and dimensional drawings; weights, descriptive specifications covering type, rating, taps and details of construction.

25-19. CONTROL CENTER. - a. General. - The equipment to be furnished and installed under this paragraph of the specification consists of an indoor control center unit complete with breakers, contactors, instrument transformers, push-buttons, selector switches, indicator lights and all internal wiring and external connections as specified or shown on the drawings.

b. Construction. - The structure shall incorporate the latest design features of high grade equipment complying with the applicable standards. The front outside surfaces shall not be drilled or welded for the purpose of attaching wires or mounting devices if such holes or fastenings will be visible from the front. Each vertical control center unit shall consist of U.S. Standard minimum 12 gauge steel plates formed and braced adequately to form a rigid self-supporting structure. The arrangement of the units shall be such that adequate space and access panels are provided for wiring and for inspection and maintenance of equipment and connections. All ferrous fastenings shall have an approved rust resistant finish and all bolts and screws shall be equipped with approved locking devices. All structures shall be designed for dead front operation. Instruments shall be the front mounted, semi-flush type. All door hinges shall be of the fully concealed, loose pin or continuous type which will permit the doors to swing through not less than 105 degrees. The control center shall be so designed that units can be easily removed or future units added as required, and future space compartments shall be furnished with guide rails, separator bars and cover plates. Each unit structure shall be provided with horizontal wiring spaces at top and bottom which shall line up with adjacent units to form raceways the length of the control center. Provisions shall be made so that a compartment door cannot be opened while the respective switch is in the closed position, so that the switch can be padlocked in open or closed position, and for locking the unit in the "tilt out" or test positions. The equipment in each compartment shall be of the tilt out or drawout type with connections made to the vertical bus by stab assemblies so constructed and reinforced as to insure maintenance of adequate contact area and pressure. Stab assemblies and bus connections shall be silver plated. Control centers shall have NEMA Type "C" construction, with plug in or stab connections for NEMA size 4 controllers and smaller. Removable sub-panels shall be provided for auxiliary or control accessories. Each operating device such as a switch or a combination starter shall be assembled as a standardized unit. Suitable guides shall be provided for aligning and supporting the units during their removal or replacement. Doors shall be such that they can be closed after a switch or starter is removed from the structure. Each unit compartment shall be barriered or baffled.

c. Buses. - All buses shall be of hard drawn copper of not less than 98 percent conductivity and shall be supported amply and rigidly by insulating supports. All bus joints shall be silver plated with provision for adequate clamping. A main horizontal 600-volt, 3-phase, 200-ampere copper bus shall be provided across the top of all the control centers from which vertical 100-ampere copper buses shall distribute power to the switches and controllers. The electrical clearances of the buses, phase to phase or phase to ground, shall be not less than 1-1/2 inches. The bus shall be sufficiently braced to withstand short circuit stresses equal to 25,000 amperes. The control center shall include an interior ground bus to which all non-current carrying parts of the structure shall be grounded. The ground bus shall be of copper 1/4 inch by 1 inch and shall run lengthwise of the control center.

d. Space Heaters. - Space heaters, with a minimum rating of 150 watts, shall be provided in each vertical section of the control center.

e. Fused Switches. - (1) General. - Each shall conform to requirements of Federal Specification W-S-865, type NDS. Each device shall be of the hand-operated, type with voltage ratings appropriate to the circuit and duty indicated.

(2) Construction. - The complete fusible switch units shall be mounted and totally enclosed in strong housings to insure proper alignment and quick mounting and dismounting. Each switch shall have an operating handle linked with an external operating handle mounted on the framework door. Position indication shall be clearly visible on the front of the switchboard and shall indicate "open", and "closed", positions. Provision shall be made for padlocking each control center switch in the open position. Name plates shall be mounted on the panels or doors adjacent to the handles. All switches shall be of the same manufacture, and switches of the same size shall be interchangeable, insofar as the specifications permit. Switches shall be removable from the front without disturbing adjacent switches. Each switch shall be suitable for repetitive operation as specified by the Underwriters' Laboratories Standards without more than routine maintenance such as contact refinishing and replacement. The contacts shall be of a design that will permit the switches to carry full load continuously, without overheating.

(3) Cartridge fuses, dual-element time-lag type, shall be nonrenewable with an interrupting rating not less than 10,000 amperes. At 500 percent current, cartridge fuses shall not blow in less than 10 seconds. Cartridge shall conform to the requirements of NEMA Standard FU 1, class H, and Federal Specification W-F-791, type I, style A.

f. Motor Starters. - Motor starters shall be of the full-magnetic type, reversing or non-reversing as required. Contactors and related equipment shall conform to the standards of construction described elsewhere in this specification. Control transformers shall be provided as shown on the wiring diagrams and shall be of sufficient capacity to operate coils and related devices, such as heaters, at a minimum of 95 percent of rated voltage without exceeding the continuous current rating.

g. Transfer Switch. - An automatic transfer switch shall be provided. The transfer switch shall be 150 amperes, 600 volt, 3 phase, 3 wire, 60 cycle switch, and shall transfer the load from normal to emergency when any phase of normal drops below 70% and automatically restore load to normal when all phases are 90% or more of rated value. An auxiliary contact shall close the engine starting circuit when normal power fails. The main contacts shall be operated by a single coil mechanism, interlocked both mechanically and electtically. The transfer switch shall be enclosed in a NEMA 1 cabinet suitable for wall mounting.

A 3-seconds fixed time delay shall be provided to prevent switch from functioning in the event of momentary outage of normal power. There shall be a 2- to 30-minute adjustable delay incorporated in the switch to delay switch from returning to normal position after normal power is available. A test switch shall be provided to simulate normal power failure for testing both the transfer switch and generator set.

h. Wiring. - (1) Type. - Power wiring shall meet the requirements of paragraph 25-05 of the specification. Control wiring shall be switchboard type, tinned copper wire. Either type AVB, designation Number 6, or type TA, designation Number 8 (NEMA Standard WC1-1955) may be used. Hinge wires shall be type AVB, designation Number 7 or type TA, designation Number 9 with Class "k" stranding. Minimum wire size shall be Number 12 AWG except that current transformer leads shall be not smaller than Number 19/22.

(2) Terminals and Installation. - All control wiring within the assembly shall be furnished and installed at the factory. All control wiring leaving equipment shall be run to terminal blocks. Terminals shall be provided for connection of remote circuits to all spare auxiliary and alarm contacts, remote control switches, and remote indicating lights where such devices are specified or applicable to the equipment concerned. There shall be no splices in the wire and all connections shall be made at terminal studs or blocks with solderless lugs or turned eyes with cup washers. Terminal stud connections shall have locknuts. Approved solderless terminals and cable clamps shall be furnished for each power conductor entering or leaving the equipment. Power and control conductors shall enter the switchgear as indicated on the contract drawings. Clamp type terminals of an approved size and type shall be provided for all main power cables leaving the board.

i. Name Plates. - (1) Each component integral piece of equipment such as a circuit breaker, relay or transformer, shall be identified with sufficient information to establish the type and rating and to permit reordering.

(2) Each compartment door and operating unit shall be provided with an identifying name plate approximately one by three inches in size or as indicated on the drawings. A switchgear assembly name plate approximately three by five inches in size shall also be provided. The above name plates shall be of laminated plastic, and shall provide for engraved white lettering on a black background.

j. Indicating Instruments. - (1) General. - All indicating instruments shall be of the rectangular, semi-flush mounted, back connected, long scale switchboard type, conforming to NEMA Standard EL-1. The mounting case shall be approximately 4-1/2 inches square. The scale shall be of the 250 degree type.

(2) Accuracy of Instruments. - Accuracy of all instruments shall be within one percent of full scale. Moving elements shall be equipped with zero adjustment on the face of each instrument.

k. Rectifier. - Suitable selenium or copper oxide type rectifier and high-low charge control device for maintaining remote mounted 24 volt storage battery (included with engine generator equipment) at full charge during periods when engine is not in operation shall be provided. When engine is operating, the battery may receive charge from an auxiliary 24V DC generator. Under these conditions, the rectifier equipment shall be automatically disconnected from the battery and shall be automatically reconnected when the engine is shut down. The rectifier, control and devices may be shelf mounted within the compartment - with connections accessible through the hinged door.

l. Generator Voltage Regulator. - (1) General. - Generator voltage regulator shall be a standard manufactured product, completely automatic in its operation. It shall be designed to apply partial or full corrective action as required by the voltage deviation from normal, and to prevent hunting of the controlled voltage, and shall be capable of forcing the generator field to its full limit and holding it at that limit indefinitely, all as approved by the Contracting Officer. The operation of the regulator shall not be affected by a variation of the frequency of the controlled voltage. The regulator shall be similar and approved equal to the General Electric Company's type GDA or the Westinghouse Electric Corporation's "Silverstat". A static type regulator meeting the performance specified herein may, with the approval of the Contracting Officer, be furnished.

(2) Sensitivity and Time of Operation. - The sensitivity of the regulator shall be such that it will detect a voltage change of 1-1/2 percent from normal operating voltage, and supply corrective action to restore the voltage to the sensitivity zone. The regulator shall apply full corrective action in 1/10 of a second for a 10 percent change in the regulated voltage.

(3) Construction. - The regulator, with all accessories, shall be suitable for mounting on the switchboard. The regulating mechanism shall be provided with a suitable enclosing case. The construction of the case shall be such as to allow ready access to the operating parts. A voltage adjusting rheostat shall be provided.

m. Rubber Matting. - The contractor shall furnish a corrugated, non-slip rubber mat of high dielectric strength and long aging qualities with each indoor control center. The mats shall be not less than 27-inches wide and shall extend along the full length of the control centers. The mat shall comply with ASTM Specifications designation D 178.

n. Painting. - All surfaces of the control centers shall be painted and, before painting, shall be thoroughly cleaned by sandblasting pickling and rinsing or by other means approved by the Contracting Officer. The cleaning process shall be followed immediately by application of a rust inhibitive wash (bonderizing or approved equal). All surfaces shall then be primed, filled where necessary, and given two coats of synthetic undercoat. The finish coat shall be a semi-gloss paint. The color of the finish coat shall be the manufacturer's standard color which nearly matches Federal Standard 595 Color No. 26440. The undercoat shall conform to the requirements of Federal Specification TT-E-543 and the semi-gloss shall conform to Federal Specification TT-E-529. The primer shall conform to Federal Specification TT-P-57 for "Paint, Zinc, Yellow-Iron Oxide Base, Ready-Mixed", Type II. One pint of the semi-gloss finish coat shall be furnished for touch-up painting after the equipment has been installed.

o. Factory Assembly and Tests. - (1) General. - All equipment shall be completely assembled at the factory and shall be designed for minimum disassembly for shipping purposes. Subdivided equipment shall be properly matchmarked to facilitate installation. Any device which cannot withstand the hazards of shipment when mounted in place shall be carefully packed and shipped separately. All parts shall be prepared for shipment so that slings for handling may be readily attached while the structures are in a railroad car. Each item of equipment supplied under this specification shall be given the manufacturer's routine factory tests and also other tests, as specified below, to insure successful operation of all parts of the assemblies. All tests required herein shall be witnessed by the Contracting Officer or his authorized representative, unless waived in writing; and no equipment shall be shipped until it has been approved for shipment by the Contracting Officer or his authorized representative. The contractor shall notify the Contracting Officer sufficiently in advance of the date of the tests so that arrangements can be made for the Contracting Officer or his authorized representative to be present at the tests. The factory test equipment and the test methods used shall conform to the applicable requirements of ASA, AIEE, and NEMA Standards, and shall be subject to the approval of the Contracting Officer or his authorized representative. The contractor shall furnish five certified copies of the reports of all tests, including complete test data. The cost of performing all tests shall be borne by the contractor and shall be included in the prices bid for the various items of equipment in the schedule.

(2) Instrument Transformers. - The potential and current transformers shall conform to NEMA Standard El-2.

25-20. DOOR BELL SYSTEM. - The door bell system in the Operator's Quarters, with brass push buttons similar and approved equal to Edwards No. 620, shall be installed at the front and rear doors. Chimes shall be Edwards No. 1605, 2-entrance type, or approved equal, located where shown on the drawings. A bell ringing transformer for the system shall be installed in the basement.

41

25-21. NAMEPLATES. - Each safety switch, pushbutton station, contactor, and motor starter shall have mounted on it a nameplate. Nameplates shall have lettered on them a description of the device controlled and the current and voltage ratings of the equipment on which the nameplate is mounted. Except as otherwise specified, nameplates shall be thermosetting laminate with white letters on black background protected by melomine overlay similar to MIL-P-78A, type GCP-H, as manufactured by Duralith Corp., or approved equal. A list of all proposed nameplates shall be submitted to the Contracting Officer for approval.

25-22. MOTORS. - Motors furnished under this and other sections of these specification shall be of sufficient size for the duty to be performed and shall not exceed their full rated load when the driven equipment is operating at specified capacity under the most severe conditions likely to be encountered. The horsepower ratings indicated on electrical plans are for guidance only and do not limit the equipment size. Unless otherwise specified, all motors shall have open frames, special class A oil and moistureproof insulation, and continuous-duty classification based on a 40°C. ambient temperature of reference.

a. Fractional-Horsepower Motors. - Fractional-horsepower motors shall conform to Federal Specification CC-M-636a.

b. Integral-Horsepower Motors. - Integral-horsepower motors shall conform to Federal Specification CC-M-641b. Polyphase motors shall be class B, squirrel-cage type, having normal-starting-torque and low-starting-current characteristics, unless other characteristics are specified elsewhere.

25-23. MOTOR CONTROL. - Each motor, or group of motors requiring a single control, shall be provided under other sections of these specification with a suitable controller and devices that will perform the functions as specified for the respective motors. Controllers shall conform to the National Electrical Manufacturers Association Standard ICI and the Underwriters' Laboratories, Inc., Standard for Industrial Control Equipment. Each motor 1/8 horsepower or larger shall be provided with thermal-overload protection. The overload-protection device shall be provided either integral with the motor or controller, or mounted in a separate enclosure. Unless otherwise specified, the protective device shall be of the manually reset type. Each phase of 3-phase motors shall be protected with an overload device. Single- or double-pole tumbler switches specifically designed for alternating-current operation only may be used as manual controllers for single-phase motors having a current rating of not in excess of 80% of the switch rating. Automatic-control devices such as thermostats or float or pressure switches may control the starting and stopping of motors directly, provided they are designed for that purpose and have an adequate horsepower rating. When the automatic-control device does not have such a rating, a magnetic starter shall be used, with the automatic-control device actuating the pilot control circuit. When combination manual-and-automatic control is specified and the automatic-control device operates the motor directly, a double-throw, three-position tumbler or rotary switch shall be provided for the manual control; when the automatic-control device actuates the pilot control circuit of a magnetic starter, the latter shall be provided with a three-position selector switch marked "Manual-Off-Automatic.

25-24. MOTOR DISCONNECT MEANS. - Each motor shall be provided with a disconnecting means under this section of the specifications, when required by the National Electrical Code even though not indicated on the drawings. A circuit breaker or horsepower-rated switch in a panelboard will be acceptable as a disconnecting means, if located within the sight of the motor controller. For single-phase motors, a single- or double-pole tumbler or snap switch, rated only for alternating current, will be acceptable for capacities less than 30 amperes, provided the ampere rating of the switch is at least 125% of the rating of the controlled equipment. Switches shall be horsepower rated in accordance with Table III of Federal Specification W-S-865. Enclosed switches shall conform to Federal Specification W-S-865, type NDS. Switches shall disconnect all ungrounded conductors.

25-25. EQUIPMENT CONNECTIONS. - Connections for equipment subject to vibration shall be made with flexible conduit. Controllers for motors, disconnect switches and all control, protective, and signal devices for motor circuits, except where such apparatus is furnished mounted and connected, and left in operating condition. Connections include those between the control center and the engine control panel furnished with the engine. Size of conductors between motors and control of protective apparatus shall be as recommended by the manufacturer of the apparatus, or as required by the National Electrical Code.

25-26. TESTS. - All wiring shall be so installed that, when completed, the systems will be free from short-circuits and grounds, and the insulation resistances shall be not less than the values given in paragraph 110-19 of the National Electrical Code. After the interior-wiring-system is completed, and at such time as the Contracting Officer may direct, the contractor shall conduct an operating test for approval. The test shall include the operation of all equipment from the emergency generator set. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The test shall be performed in the presence of the Contracting Officer or his authorized representative. The contractor shall furnish all instruments and personnel required for the tests, and the Government will furnish the necessary electric power. The control center will be inspected at the place of manufacture prior to shipment.

25-27. GUARANTEE. - The following equipment to be furnished under this section of the specifications shall be guaranteed in accordance with the guarantee provisions set forth in the SPECIAL CONDITIONS.

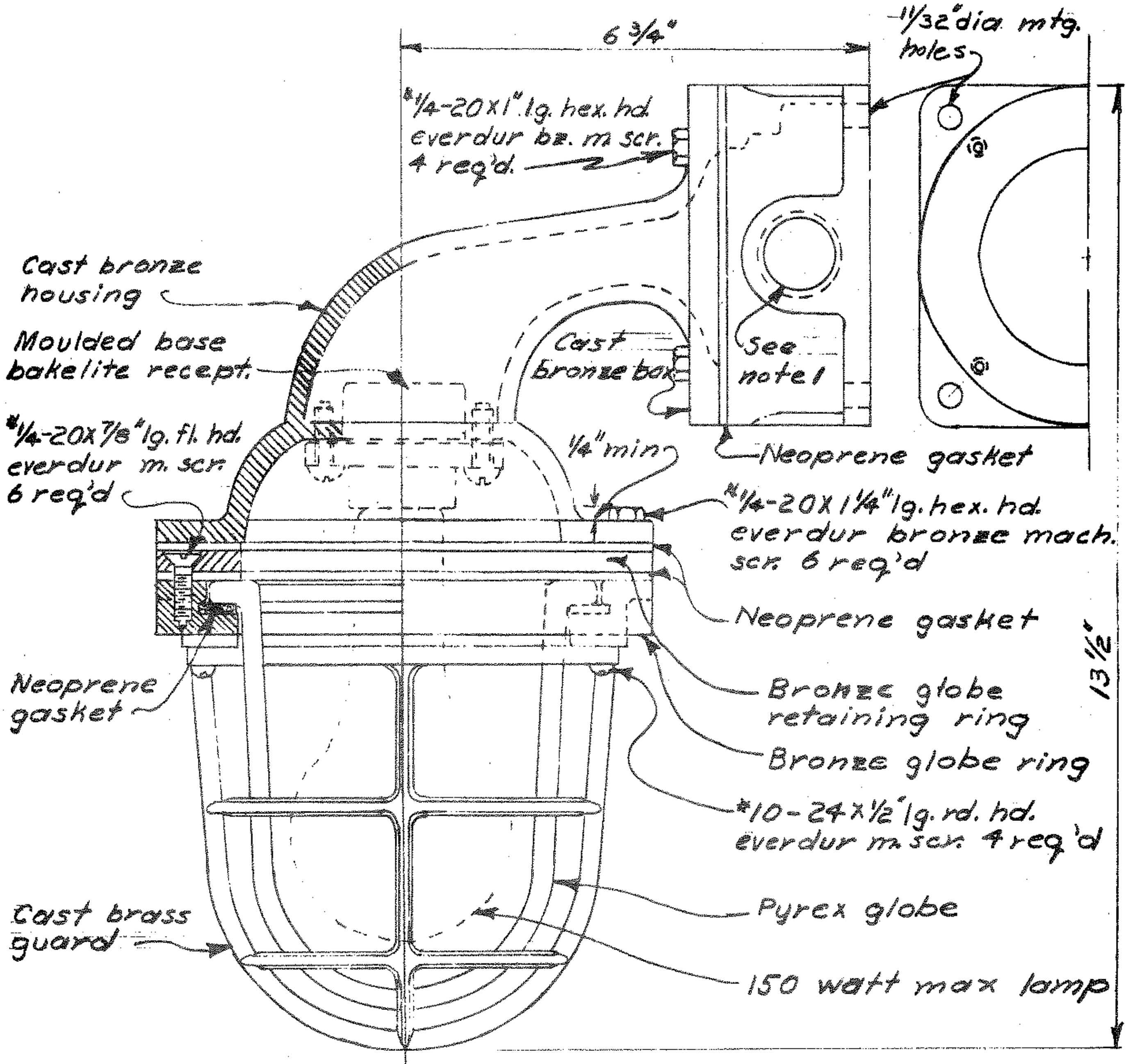
Control Center
Switches
Circuit Breakers
Panelboards
Transformers
Wire and Cable
Lighting Fixtures

25-08. PAYMENT - All electrical work performed under this section, including grounding system, will be paid for under the applicable contract prices as outlined below and shall include all costs of furnishing, installing and testing the electrical installations as shown on the drawings for the respective installations.

a. All interior electrical work for the Operator's Quarters, Utility Building, and Garage will be paid for and included under the applicable lump sum contract prices for Items 96, 97 & 98 "Utility Building", Operator's Quarters", and "Garage".

b. Payment for all interior electrical work for the Flood Control Tower and the Flood Control Gate Shaft will be included under the applicable lump sum contract prices for Items No. 82 and 86, "Electrical Work, Interioe".

c. If additional lengths of ground rods are installed as directed in accordance with requirements of Paragraph 25-04a, payment will be made therefor by the pound under Item 73, "Miscellaneous Metals".


6 3/4"
11/32" dia mtg. holes
*1/4-20X1" lg. hex. hd. everdur bz. m. scr. 4 req'd.
Cast bronze housing
Moulded base bakelite recept.
Cast bronze box
See note 1
*1/4-20X7/8" lg. fl. hd. everdur m. scr 6 req'd
Neoprene gasket
1/4" min
*1/4-20X1 1/4" lg. hex. hd. everdur bronze mach. scr. 6 req'd
Neoprene gasket
13 1/2"
Neoprene gasket
Bronze globe retaining ring
Bronze globe ring
*10-24X1/2" lg. rd. hd. everdur m. scr. 4 req'd
Pyrex globe
Cast brass guard
150 watt max lamp

Note 1. 1" max. conduit drilled & tapped holes. Size & location in cast bronze box as required

TYPE "L"

Bracket, watertight, heavy cast bronze angle body with cast brass guard, cast bronze outlet box with conduit hubs, and heavy clear globe made of borosilicate or pyrex glass and having a low coefficient of expansion (3.2×10^{-6} or less.) Assembly shall be made watertight with suitable gaskets and Everdur bronze machine screws. Provide heavy duty bakelite or porcelain lamp receptacle mounted in body with suitable gaskets. Fixture shall be watertight under 50 foot head of 3 weeks duration and shall permit continuous lighting either under or above water without damage. Fixture wire shall be 600 volt silicone rubber, N.E.C., type SFF-2.

15 JULY 1959

Revisions to Electrical Fixture Drawing No. 40-06-04

1. The following revisions will be incorporated in the specifications of the subject drawing pending revision of the sheets by the Chief of Engineers:

a. Sheet No. 3. - Add the following: "Reflector and socket shall be easily detached as a unit."

b. Sheets Nos. 5 and 7. - Add the following: "Fixture necks shall be provided with openings for ventilation."

c. Sheets Nos. 8 and 9. - Delete requirement for "threaded neck" construction; eighth line, delete "asbestos".

d. Sheet No. 10. - First line, delete "screw type"; third line, insert "bakelite or" before "porcelain"; fifth line, delete "asbestos".

e. Sheet No. 11. - First line, delete "screw type"; third line, insert "bakelite or" before "porcelain"; fifth line, delete "asbestos"; sixth line, delete the words "round or" and substitute "a".

f. Sheet No. 12. - Second line, delete "20 gauge" and substitute "22 gage"; sixth line, delete "while the inside reflecting surface of holders shall be of white enamel".

g. Sheet No. 16. - After "light proof continuous hinge" add "or concealed-type drop hinges".

h. Sheet No. 26. - Last line, insert "insulated" before "pull chain".

i. Sheet No. 43. - Delete sentences 3 to 7, inclusive, and 9 to 13, inclusive. Line 22, after "starters," insert "for preheat lamps". Add the following:

> "Fixtures shall conform to Federal Specification W-L-331, type I or II, style B, class A. Reflectors shall be porcelain enameled steel. Reflectors having openings permitting an 8-15% upward component of light are acceptable. Sockets shall be of a type requiring an axial movement of the lamp for insertion and removal."

j. Sheet No. 44. - Delete sentences 3 to 6 inclusive, 8 to 11, inclusive. Line 20, after "starters," add the following:

> "Fixtures shall conform to Federal Specification W-L-331, type I or II, style B, class A. Reflectors shall be porcelain enameled steel. Reflectors having openings permitting an 8-15% upward component of light are acceptable. Sockets shall be of a type requiring an axial movement of the lamp for insertion and removal."

k. Sheet No. 46. - Width of four light fixtures should be approximately 16 inches. Line 16, after "78%" insert "For two lamp fixtures and 75% for three and four lamp fixtures".

l. Sheet No. 47. - Line 12, delete "curved" and substitute "straight". Last line, add the following: "For two lamp fixtures and 75% for three and four lamp fixtures."

Rev 2/2/62

CORPS OF ENGINEERS

DEPARTMENT OF THE ARMY

ELECTRICAL SYMBOLS

GENERAL OUTLETS

CEILING	WALL	
○	-○	Outlet.
Ⓑ	-Ⓑ	Blanked Outlet.
Ⓓ		Drop Cord.
Ⓗ	-Ⓗ	Unit Heater or Cooler
◍	-◍	Night Light
Ⓕ	-Ⓕ	Fan Outlet.
Ⓙ	-Ⓙ	Junction Box.
Ⓛ	-Ⓛ	Lamp Holder.
Ⓛ$_{PS}$	-Ⓛ$_{PS}$	Lamp Holder with Pull Switch.
Ⓢ	-Ⓢ	Pull Switch.
	-Ⓣ	Thermostat 5'-0" Up Lamp.
Ⓧ	-Ⓧ	Exit Light Outlet.
Ⓒ	-Ⓒ	Clock Outlet
▭○▭	▭○▭	Fluorescent Fixture Outlet

SWITCH OUTLETS

S	Single Pole Switch. 4'-0" Up
S_2	Double Pole Switch.
S_3	Three Way Switch.
S_4	Four way switch
S_D	Automatic Door Switch.
S_E	Electrolier Switch.
S_K	Key Operated Switch.
S_P	Switch and Pilot Lamp.
S_{MC}	Momentary Contact Switch.
S_{RC}	Remote Control Switch.
S_{WP}	Weatherproof Switch.

CONVENIENCE OUTLETS

=⊖	Duplex Convenience Outlet. 1'-0" Up
=⊖$_{1,3}$	Convenience Outlet other than Duplex. 1=Single, 3=Triplex, etc.
=⊖$_{WP}$	Weatherproof Convenience Outlet.
≡⊖$_R$	Range Outlet.
=⊖$_S$	Switch and Convenience Outlet.
=⊖-[R]	Radio and Convenience Outlet.
◉	Special Purpose Outlet (Des. in Spec.)
⊙	Floor Outlet.
-⊖	20A. 250 V. Receptable and plug, polarized.
-◑	30A. 250 V. Receptacle and plug, polarized.

SPECIAL OUTLETS

○$_{a,b,c\text{-etc.}}$
=⊖$_{a,b,c\text{-etc.}}$;
S$_{a,b,c\text{-etc.}}$

Any Standard Symbol as given above with the addition of a lower case subscript letter may be used to designate some special variation of Standard Equipment of particular interest in a specific set of architectural plans.

When used they must be listed in the Key of Symbols on each drawing and if necessary further described in the specifications.

□$_{a,b,c}$	Special Auxiliary Outlets. Subscript letters refer to notes on plans or detailed description in specifications.

PANELS, CIRCUITS AND MISCELLANEOUS

■	Lighting Panel.
▨	Power Panel.
——	Branch Circuit; Concealed in Ceiling or Wall.
– –	Branch Circuit; Concealed in Floor.
······	Branch Circuit; Exposed.
—•→	Home Run to Panel Board. Indicate number of Circuits by number of arrows. Note: Any circuit without further designation indicates a two-wire circuit. For a greater number of wires indicate as follows: -/-/-/- (3 wires) -/-/-/-/- (4 wires), etc.
━━	Feeders.
-·-·-·	Auxiliary System Circuits.
≡▭≡	Underfloor duct and junction box. Triple system. Note: Single and double systems indicated by one or two lines.
Ⓖ	Generator.
Ⓜ	Motor.
■	Service Switch or Breaker
⊠	Controller.
▭'	Isolating Switch.

AUXILIARY SYSTEMS

⊡	Push Button.
□/	Buzzer.
□○	Bell.
-◇	Annunciator.
◀	Telephone 1'-0" up
◁	Interconnecting Telephone. 1'-0" Up
▷◁	Telephone Switchboard.
[T]	Bell Ringing Transformer.
[F]○	Fire Alarm Bell.
[F]	Fire Alarm Station.
⊠	City Fire Alarm Station.
[FA]	Fire Alarm Central Station.
[FS]	Automatic Fire Alarm Device.
[W]	Watchman's Station. 4'-6" Up
[[W]]	Watchman's Central Station.
[H]	Horn.
[R]	Radio Outlet. 1'-0" Up
[SC]	Signal Central Station.
□	Interconnection Box.

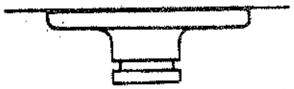
Note: Heights to center wall outlets unless otherwise specified or noted.

Bracket Light---------------------5'-8
Bracket Light over Mirror--------6'-3"

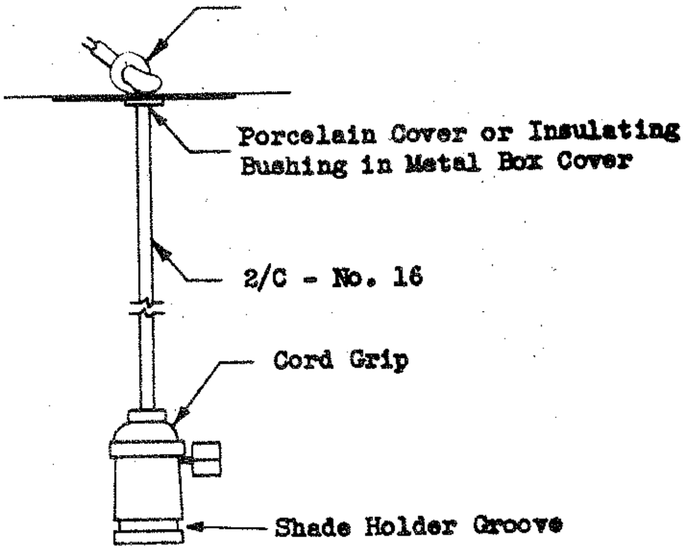
15 August 1950

Dwg. No. 40-06-04
Sheet 1

ARMY-NED-BOSTON



OUTLET BOX RECEPTACLE
Type LR



DROP CORD
Type D C

Type D C:

Drop cord to be key type medium base porcelain socket attached to two conductor No. 16 Type "SJ", "SJO" or "SJT" cord of sufficient length to suspend key of socket 6 feet 6 inches above finished floor. Cord to have suitable strain knot. Outlet box cover to have suitable insulating bushing.

Type L R:

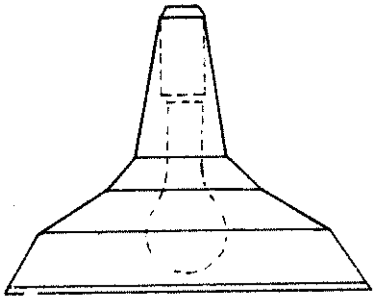
Outlet box keyless lamp receptacle to be of porcelain, rated not less than 660 watts, and provided with a shade-holder groove. The device shall be suitable in size for the outlet box on which it is to be mounted.

Type LRP:

Same as Type LR except furnished with a pull switch, short length of chain, four foot length linen cord and ball. Rating, 250 watts minimum.

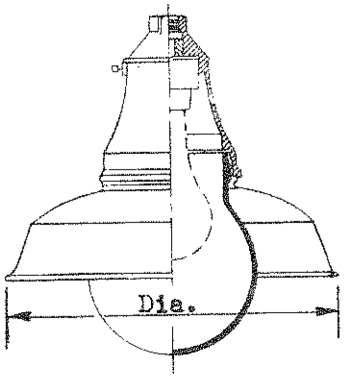
Dwg. No. 40-06-04
Sheet 2

15 August 1950

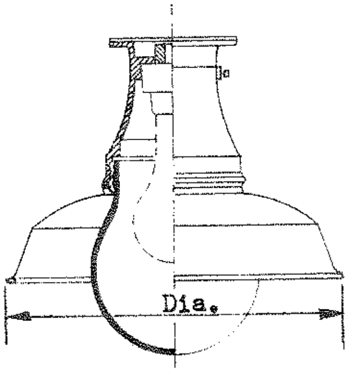


TYPE	DIAMETER	LAMP
I-1	12"	60-100 W
I-2	14"	150 W
I-3	16"	200 W
I-4	18"	300-500 W

Industrial porcelain enameled steel, dome reflector having a hood suitable for the outlet from which the fixture is supported. Socket shall be keyless unless specifically noted otherwise. Fixture shall be ceiling mounted except where noted on drawings, in which case the pendant shall be one half inch threaded conduit. Fixture shall comply with the applicable requirements of Federal Specification W-F-412.



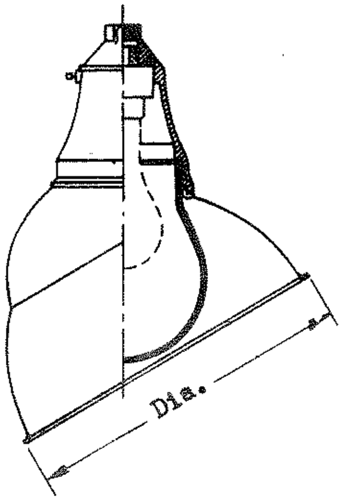
Pendant Hood Type



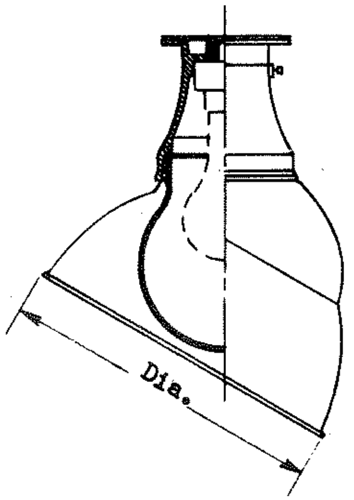
Ceiling Hood Type

Pendant Type	Lamp Watts	Diameter of Reflector	Ceiling Type
V-1	75-100	12	V-5
V-2	150	14	V-6
V-3	200	16	V-7
V-4	300-500	18	V-8

Heavy duty vaportight (vapor proof) lighting fixture with cast metal pendant or ceiling hood, heavy gauge steel, porcelain enameled dome reflector of the acid resisting, threaded neck type. Unit shall be ruggedly constructed for either weather or vapor proof applications and maintain high efficiency output. The cast metal hood shall be designed for either ½ inch conduit or 4 inch outlet box mounting designed to accommodate screw globe and reflector. Provide asbestos gasket between hood and globe, sealing gland and gaskets for reflector and wire entrance. Globe to be clear, heat-resisting glass. Provide medium or mogul base porcelain socket as required for lamp size. Fixture to be wired with two No. 14 Type "AF" conductors. Hood type to be as noted on project drawings. Ferrous parts shall have corrosion resistant finish.



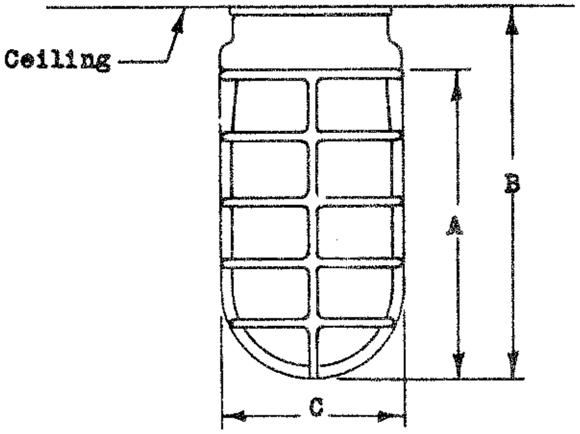
Pendant Hood Type



Ceiling Hood Type

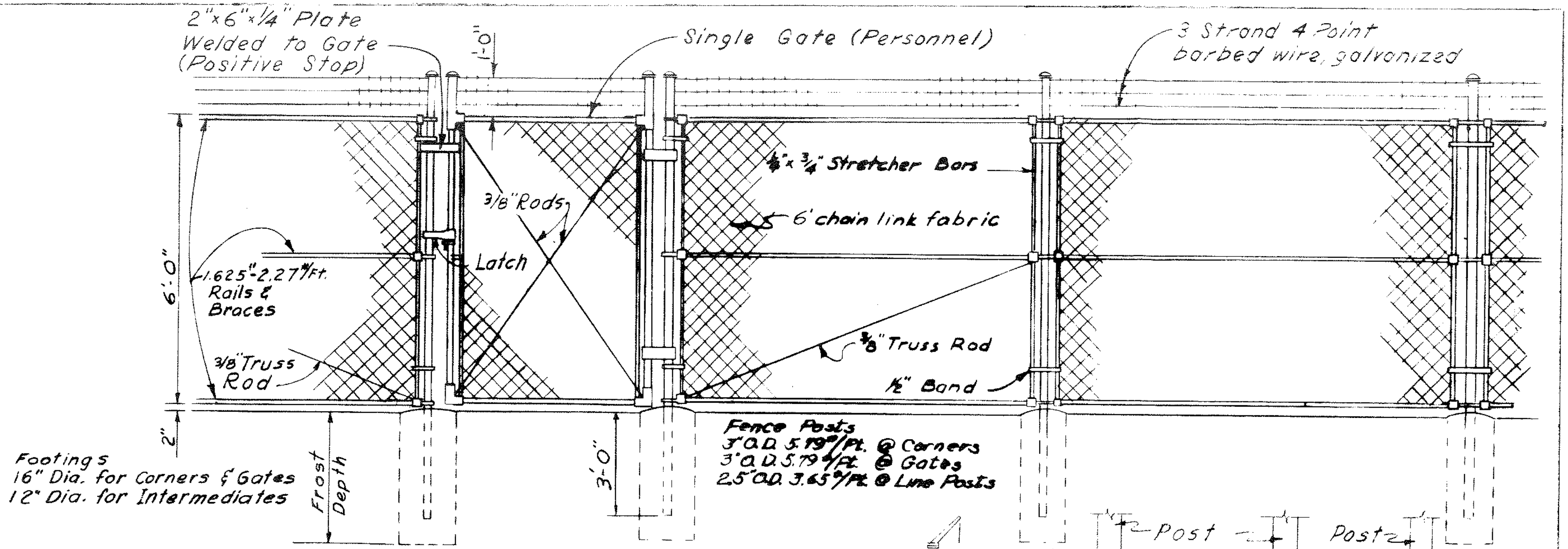
Pendant Type	Lamp Watts	Diameter of Reflector	Ceiling Type
VA-1	75-100	10	VA-4
VA-2	150-200	12	VA-5
VA-3	200-500	14	VA-6

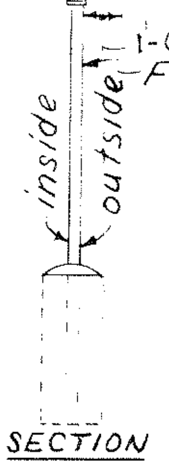
Heavy duty vaportight (vapor proof) lighting fixture with cast metal pendant or ceiling hood, heavy gauge steel, porcelain enameled 30 degree symmetrical angle reflector of the acid resisting, threaded neck type. Unit shall be ruggedly constructed for either weather or vapor proof applications and maintain high efficiency output. The cast metal hood shall be designed for either ½ inch conduit or 4 inch outlet box mounting designed to accommodate screw globe and reflector. Provide asbestos gasket between hood and globe, sealing gland and gaskets for reflector and wire entrance. Globe to be clear, heat-resisting glass. Provide medium or mogul base porcelain socket as required for lamp size. Fixture to be wired with two No. 14 Type "AF" conductors. Hood type to be as noted on project drawings. Ferrous parts shall have corrosion resistant finish.



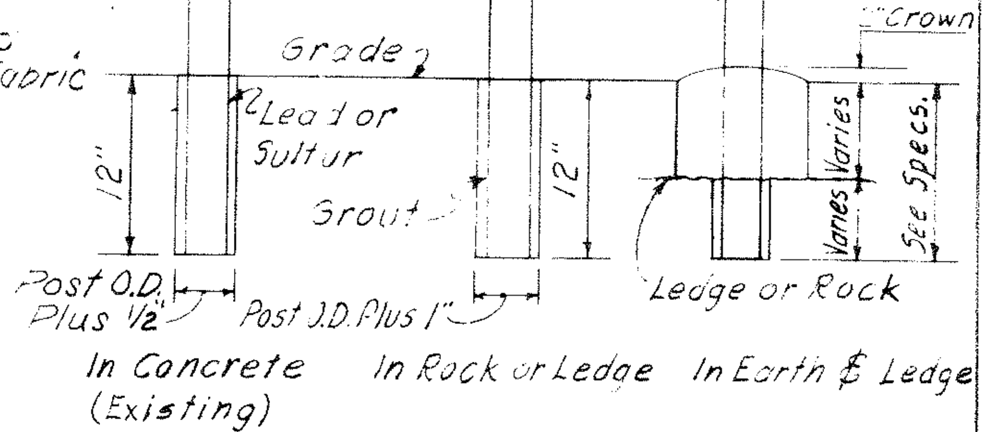
Type	Lamp Size	A	B	C
VG-1	100	6-7/8	8¼	4¼
VG-2	150-200	9-3/8	10¾	5¼

Ceiling type, heavy cast metal body with screw type cast metal guard and clear glass screw type globe. Provide screw terminal, heavy duty, porcelain lamp receptacle mounted in cast body with suitable impregnated asbestos gaskets. Cast body to mount directly on 4 inch round or cast outlet box with 4 non-ferrous screws. Provide suitable gasket for outlet. Ferrous metal parts shall have corrosion resistant finish.





SECTION



FENCE POST DETAILS

GENERAL NOTES:

1. Top and bottom of fabric shall have twisted and barbed finish.
2. All metal shall be hot dipped galvanized.
3. **Fences and gates shall be furnished complete with all necessary fittings.**
4. For gates-sizes of pipe, sag rods and turnbuckles shall be as recommended by the manufacturer.
5. Fabric to be chain link 6'-0" wide, No. 9 guage, 2" mesh galvanized.
6. Concrete bases shall extend down below FROST LINE.
7. Gates shall be provided with a positive stop.
8. Fence to have overhang arm, 12 guage pressed steel or wrought iron, carrying 3 strands of 4 point barbed wire.

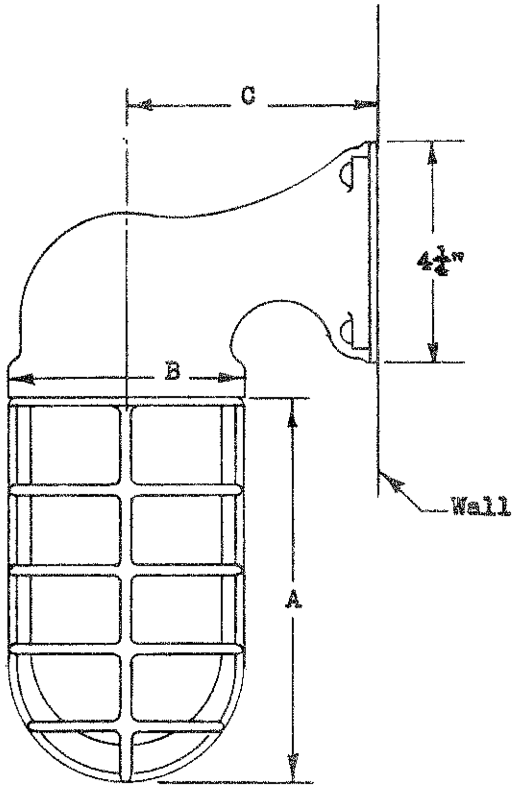
Revised 10/5/61

TRANSFORMER PEN FENCE

6' FABRIC

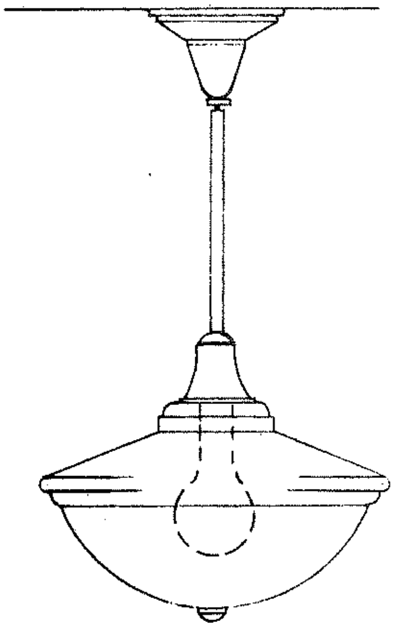
SEPTEMBER 1958

DWG. NO. 40-16-03

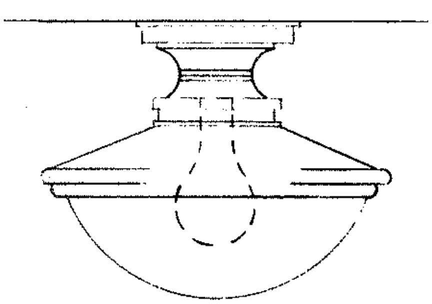


Type	Lamp Size	A	B	C
VG-3	50-100	6-1/8	4-3/8	2-7/8
VG-4	150-200	8-5/8	5-3/8	2-7/8

Bracket, weatherproof, heavy cast metal angle body with screw type cast metal guard and clear glass screw type globe. Provide screw terminal, heavy duty, porcelain lamp receptacle mounted in body with suitable impregnated asbestos gaskets. Cast body to mount directly on 4 inch round or cast outlet box with 4 non-ferrous screws. Provide suitable gasket for outlet. Ferrous metal parts shall have a corrosion resistant finish.



Type ES

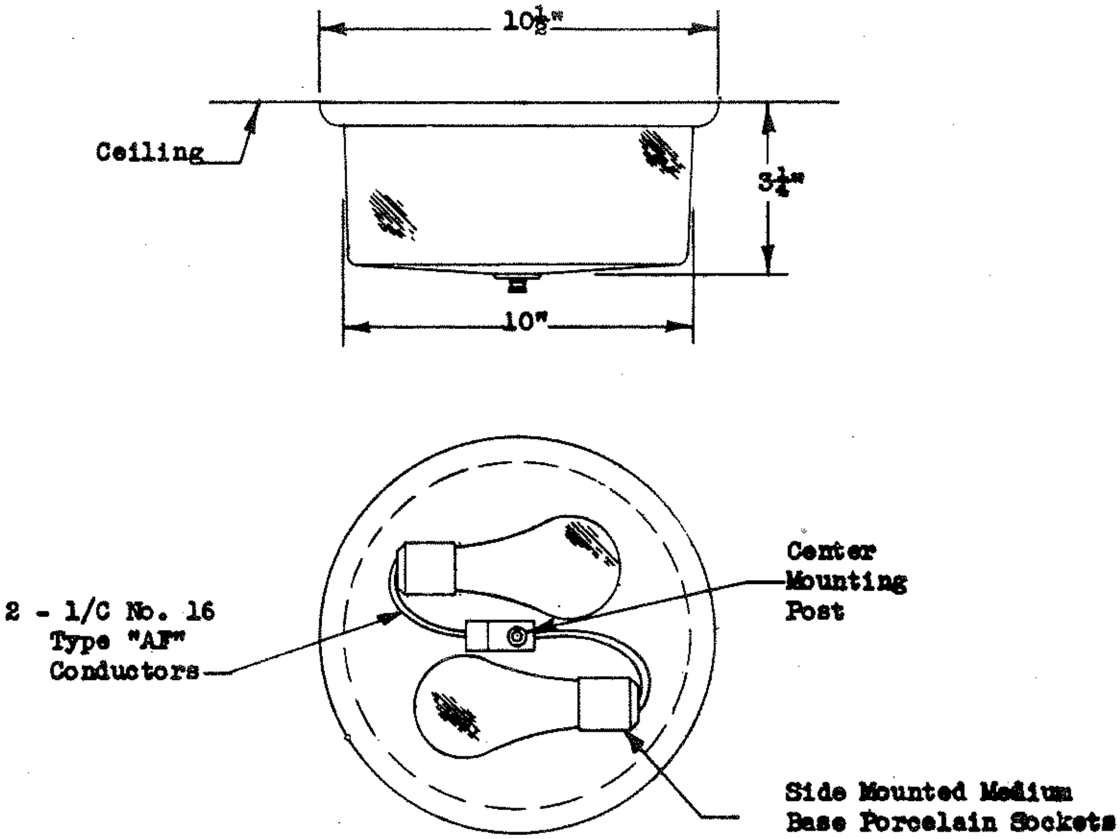


Type EC

Pendant Type	Watts	Ceiling Type
ES-1	100-150	EC-1
ES-2	200	EC-2
ES-3	300	EC-3
ES-4	500	EC-4

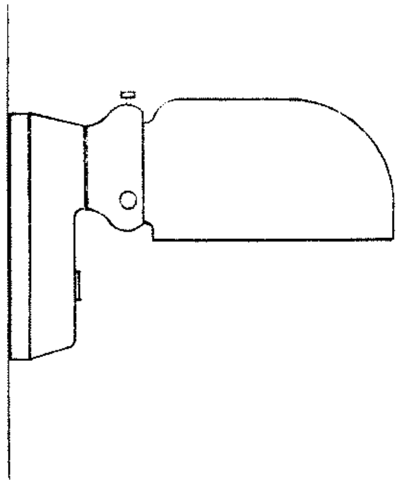
Fixtures to be of the pendant or ceiling type as indicated. All metal to be of not less than No. 20 gauge steel or brass. Glass holders shall be of the safety, screwless type and shall be provided with a porcelain keyless socket. Mogul sockets to be provided for 300 and 500 watt fixture. Finish of all exposed metal parts to be statuary bronze while the inside reflecting surface of holders shall be of white enamel.

Glassware to be of the highest grade diffusing glass having low absorption. Efficiency to be not less than 83% with a maximum brightness of not more than 3.0 candlepower per square inch, when viewed at any angle below a horizontal plane through the neck of the globe. Glass diameter to be 12" for 100-150 watt lamps, 14" for 200 watt, 16" for 300 watt and 18" for a 500 watt lamp.


10½"
Ceiling
3¼"
10"
Center Mounting Post
2 - 1/C No. 16 Type "AF" Conductors
Side Mounted Medium Base Porcelain Sockets

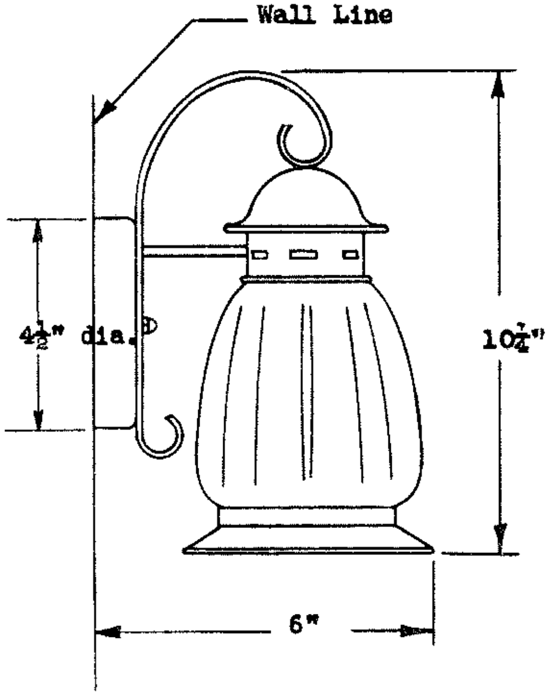
TYPE CL-I

General diffusing, one piece, shallow band ceiling fixture with drum type, white opal glass globe for maximum of two 75 watt lamps. Shallow band and back plate to be one piece of 22 gauge metal with exposed portion of band to have polished chromium finish, reflector portion to have baked synthetic white enamel finish. Drum globe to be supported by center or side fastenings as required. Provide suitable felt washer under cap nut, if center supported.



TYPE R-2.
Wall bracket consisting of a glazed, white porcelain base, medium base keyless socket, single receptacle and a glass shade. Receptacle to be removable. Shade to be of white or opal glass. Height of base to be not less than 5". Shade holder screws to be of brass, or of steel with polished chromium finish. Fixture to be suitable for mounting on either a 3¼" or 4" outlet box.

TYPE R-3.
Same as above except fixture to be furnished with a pull chain switch.



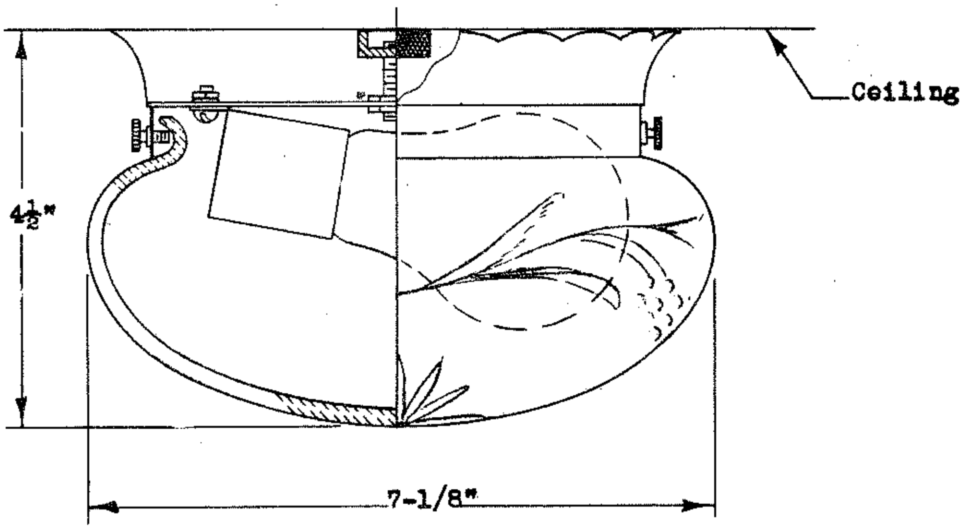
TYPE R-5

One light weatherproof bracket fixture constructed of not less than 0.028" thick (23 ga.) brass and fitted with medium base porcelain socket for 40 watt lamp. Curved arm shall be of 0.125" thick aluminum. All parts except ornamentation shall have a high lustre black polymerizing type resin base finish. All high lustre finishes shall be acid dipped, polished and sealed with a water-white baked lacquer.

Glass to be clear, thick, pressed and polished with flutings or other ornamental design and shall be held in place by knurled brass screws.

Fixture shall be wired with #18 ga. moisture resistant thermoplastic insulated conductors.

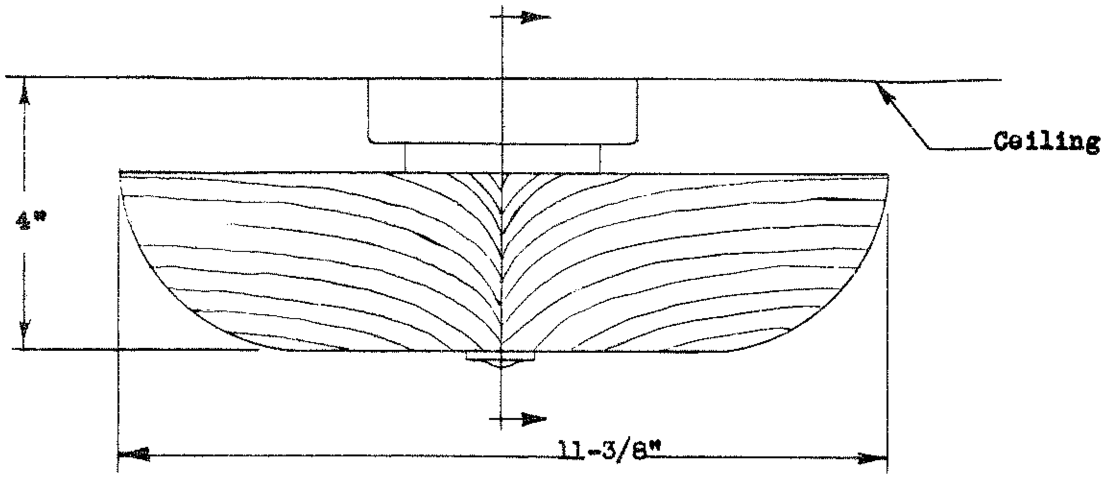
Screws, fittings and ornamentation shall have a high lustre brass finish.

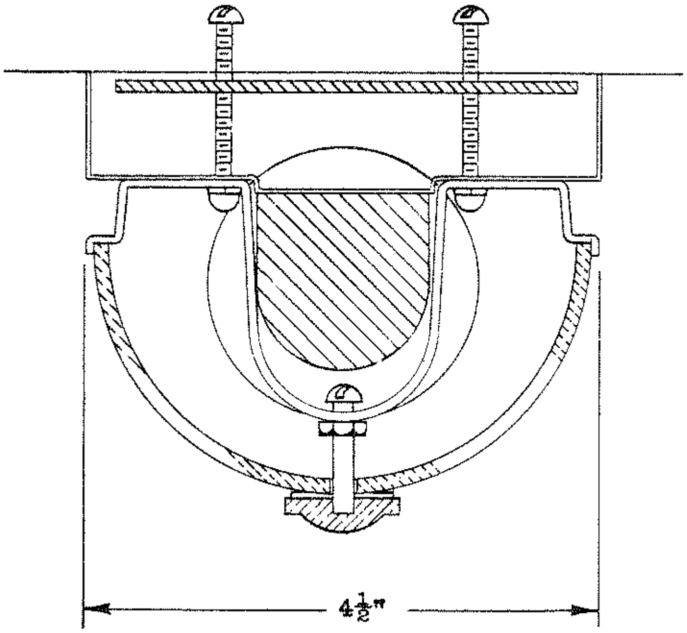


TYPE R-9

Ceiling fixture, 40 watt size, with one light medium base porcelain socket wired with heat resistant asbestos covered wire, 18 gauge. Scalloped canopy of 22 gauge brass. All exposed metal parts to be finished in high lustre, acid dipped, polished and protected against deterioration by water-white baked lacquer.

Glass to be frosted, with colonial cut design.





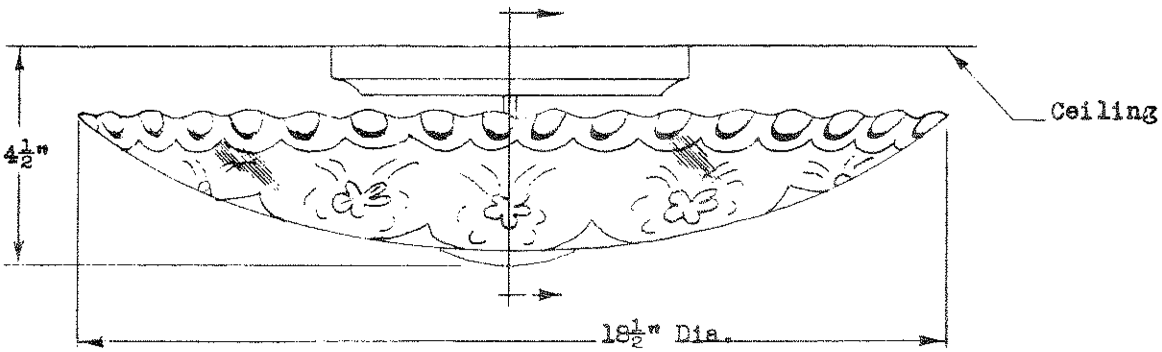
Section

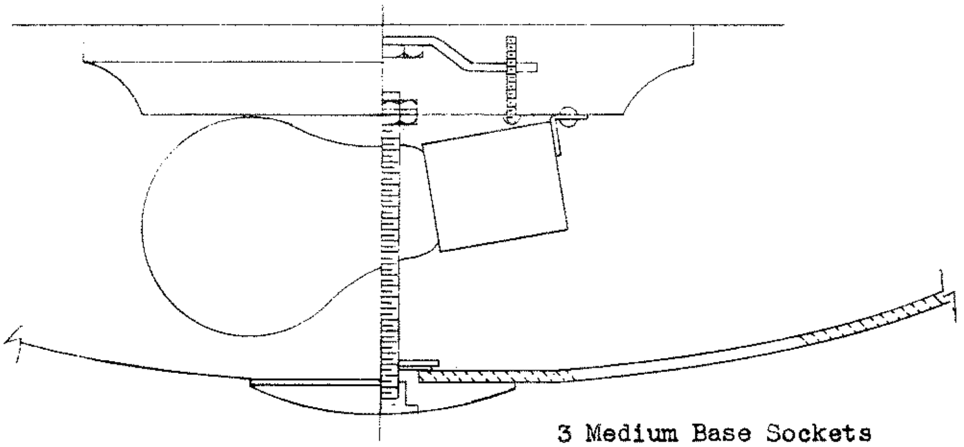
TYPE R-10

Two light ceiling fixture with medium base twin porcelain socket to take up to two 60 watt lamps. Canopy and glass support shall be of aluminum with polished finish. Exposed metal parts to be acid dipped, polished and protected against deterioration by water-white baked lacquer.

White bent glass shield to have modern design.

ARMY NED BOSTON





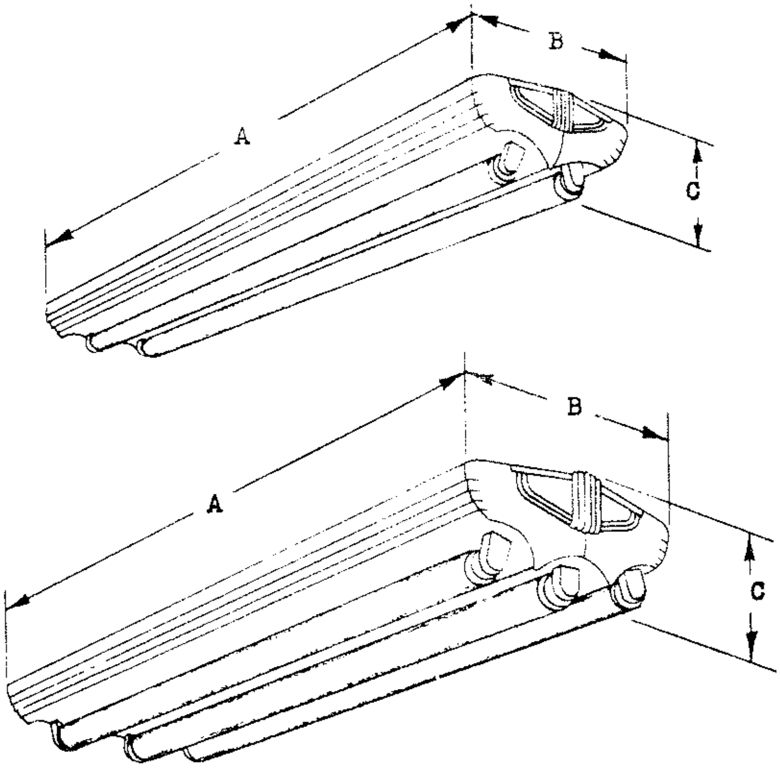
Section

TYPE P-12

Three light ceiling fixture with medium base porcelain sockets wired with heat resistant asbestos covered wire, 18 gauge, to take up to three 40 watt lamps. Canopy of 0.022" thick (24 gauge) steel; bottom disk of 0.035" thick (20 gauge) brass.

Metal holder finished in semi-gloss white enamel. Bottom knob finished in high lustre brass. All metal parts acid dipped, polished and protected against deterioration by water-white, baked lacquer.

Swirling three color floral silk screen pattern white glass with clear, thumb print scalloped edge, annealed edges to minimize chipping.

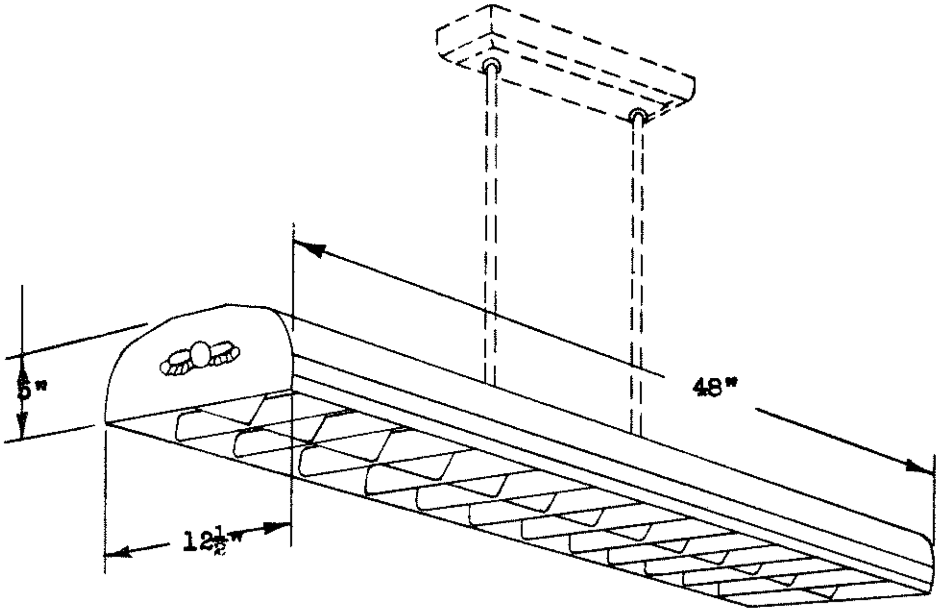


TYPE F-7 (Surface mounting)
TYPE F-8 (Suspension mounting)

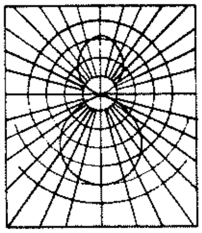
Lamp Watts	Dimensions, Inches A	B	C
2-20	28	9½	4-3/8
3-20	28	11½	5¼
2-40	52	9½	4-3/8
3-40	52	11½	5¼

Exposed tube, commercial ceiling type fluorescent fixture providing maximum wide spread and downward illumination suitable for surface or suspension mounting. 40 watt fixtures shall be suitable for continuous row mounting. Body shall be heavy gauge die formed steel treated to prevent oxidation and finished with a baked on synthetic white enamel finish. Provide hanger straps or pendants as specified. Unit to be completely wired with No. 16 Type "AF" conductors and equipped with all necessary auxiliaries conforming to Federal Specifications W-L-131. Starters shall be of the lockout type manually reset and ballasts shall be of the high power factor multi-lamp type.

Number and rating of lamps to be as specified or as noted on project drawings.



TYPE F-13 (Pendant mounting)
TYPE F-131 (Pendant mounting, continuous)
TYPE F-14 (Surface mounting)
TYPE F-141 (Surface mounting, continuous)



Typical Distribution

Ceiling or suspended commercial type of steel with curved steel side panels and shielding with direct-indirect type distribution. Unit shall be suitable for surface or pendant mounting individually or in continuous rows, as specified. Reflector top housing and ends to be die formed of 20 gauge steel treated to prevent oxidation and outer surfaces finished with baked on metallic silver grey enamel. Louvers shield to be of steel designed and spaced to provide shielding of at least 35° crosswise and 25° lengthwise. Reflector, all interior finishes and louver vanes to be finished with high reflecting factor synthetic white enamel. Lampholder brackets to be of 0.05" thick (18 gauge) steel. Fixture to be completely wired for two 40 watt fluorescent lamps. Auxiliaries to conform to Federal Specifications W-L-131. Starters shall be of the lockout type manually reset. Ballasts shall be of the high power factor multi-lamp type. Individual units to be supported with twin stem pendant. Minimum overall efficiency shall be not less than 82%. Number of fixtures required for continuous strips to be as specified or as noted on project drawings.

SECTION 26

HEATING SYSTEMS, FORCED-WARM-AIR; OIL-FIRED FURNACE
(Items 78 & 83)

(Index)

Paragraph No.	Paragraph Title	Page No.
26-01	Scope	26-1
26-02	Applicable Publications	26-1
	a. Federal Specifications	26-1
	b. Military Specification	26-1
	c. U.S. Department of Commerce Commercial Standards	26-1
	d. American Standards Association Standard	26-2
	e. National Association of Fan Manufacturers, Inc. Bulletin	26-2
	f. National Board of Fire Underwriters Pamphlets	26-2
26-03	General	26-2
	a. Standard Products	26-2
	b. Approval of Materials and Equipment	26-2
	c. Standards of Underwriters' Laboratories, Inc.	26-3
26-04	Materials and Equipment	26-3
	a. Aluminum Sheets	26-3
	b. Asphalt Varnish	26-3
	c. Copper Tubing	26-3
	d. Electrical Materials and Appliances	26-3
	e. Firebrick	26-3
	f. Fire Clay	26-3
	g. Galvanized Iron or Steel Sheets	26-3
	h. Gate Valves	26-3
	i. Mechanical Equipment	26-3
	j. Pipe Fittings	26-4
	k. Pipe Threads	26-4
	l. Steel Pipe	26-4
	m. Steel Sheets (Uncoated)	26-4
	n. Unions	26-4
26-05	Workmanship	26-4
26-06	Furnace Unit	26-4

Paragraph No.	Paragraph Title	Page No.
	a. General	26-4
	b. Heat Exchanger	26-4
	c. Combination Chamber	26-4
	d. Cabinet Encasing	26-5
	e. Supply-Fan Unit	26-5
	f. Air Filters	26-5
26-07	Oil-Burning Equipment	26-5
	a. Oil Burner	26-5
	b. Motor	26-6
	c. Automatic Draft Regulator	26-6
	d. Fuel-Oil Storage Tank	26-6
	e. Oil Pipe and Fittings	26-6
26-08	Fuel Oil Gage	26-6
26-09	Controls	26-7
	a. Bonnet Thermostats	26-7
	b. Room Thermostats	26-7
26-10	Smoke Connections	26-7
26-11	Flexible Connections	26-7
26-12	Ductwork	26-8
26-13	Registers	26-8
26-14	Electrical Work	26-8
26-15	Painting and Finishing	26-8
26-16	Operation and Maintenance Instructions	26-8
26-17	Tests	26-9
26-18	General Controls	26-9
	a. Pneumatic Controls	27-9
26-19	Guaranty	26-9
26-20	Payment	26-10

SECTION 26

HEATING SYSTEMS, FORCED-WARM-AIR; OIL-FIRED FURNACE
(Items 78 & 83)

26-01. SCOPE. - This section covers the installation of the forced-warm-air heating systems, complete, for the Water Supply Intake Tower and the Flood Control Operating House.

26-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification:

a. Federal Specifications.

HH-B-671d	Brick; Refractory, Fire-Clay
HH-C-451c	Clay; Fire, Ground
QQ-A-359d	Aluminum-Alloy Plate and Sheet 3003
QQ-S-636	Steel; Carbon (Low-Carbon), Sheets and strips
QQ-S-775a	Steel, Sheets, Carbon, Zinc-Coated
TT-V-51a	Varnish; Asphalt
VV-F-815 & Am-1	Fuel Oil Burner
WW-P-406b	Pipe; Steel (Seamless and Welded)(For Ordinary Use)
WW-P-521d & Am-1	Pipe-Fittings; Malleable-Iron, Wrought Iron and Steel, (Screwed), 150 Pound
WW-T-799a & Am-1	Tubing; Copper, Seamless (for Use with Solder-Joint or Flared-Tube Fittings)
WW-U-531a	Unions; Pipe, Steel or Malleable Iron, Threaded Pipe Connection, 250 p.s.i. WSP; 500 p.s.i. WOG (cold, nonshock)
WW-V-0054a (GSA-FSS)	Valves, Bronze, Gate; 125- and 150-Pound, Screwed and Flanged (for Land Use)
WW-V-58 & Am-1	Valves, Cast-Iron, Gate; 125- and 250-Pound, Screwed and Flanged (for Land Use)
GGG-P-351a	Pipe-Threads; Taper (American-National)

b. Military Specification. -

MIL-P-15147B	Primer and Enamel, Coal Tar.

c. U.S. Department of Commerce Commercial Standards. -

CS75-56	Automatic Mechanical-Draft Oil Burners Designed for Domestic Installations
CS195-54	Warm Air Furnaces Equipped with Pressure Atomizing or Rotary Type Oil Burners

d. American Standards Association Standard. -

B19-1938	Safety Code for Compressed Air Machinery and Equipment

e. National Association of Fan Manufacturers, Inc., Bulletin. -

No. 110	Standards, Definitions, Terms and Test Codes for Centrifugal, Axial and Propeller Fans (Current Issue)

f. National Board of Fire Underwriters Pamphlets. -

No. 31	Installation of Oil Burning Equipment (Current Issue)
No. 90A	Air Conditioning and Ventilating Systems of Other than Residence Type (Current Issue)
No. 90B	Residence Type Warm Air Heating and Air Conditioning Systems (Current Issue)

26-03. GENERAL. - The contract drawings indicate the extent and general arrangement of the heating system. If any departures from the contract drawings are deemed necessary by the contractor, details of such departures and the reasons therefor shall be submitted in writing as soon as practicable to the Contracting Officer for approval. No such departures shall be made without the prior written approval of the Contracting Officer. The dimensions of the heater room are as indicated on the drawings. Heating equipment, ductwork, and piping arrangements shall provide adequate and acceptable clearances for entry, servicing, and maintenance. The warm-air heating installation shall conform to Pamphlets Nos. 90A and 90B of the National Board of Fire Underwriters.

a. Standard Products. - The equipment to be furnished under this specification shall be essentially the standard product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, component parts of the system need not be the products of the same manufacturer.

b. Approval of Materials and Equipment. - As soon as practicable and within 30 days after the date of award of the contract and before commencement of the installation of any materials or equipment, a plan and necessary elevations of the equipment-room layout showing the proposed heating equipment, ductwork, and all applicable appurtenances therefor, with clearances, together with a complete schedule of the materials and equipment proposed for installation shall be submitted in six copies for the approval of the Contracting Officer. The schedule shall include catalogs, cuts, diagrams, drawings, and such other descriptive data as may be required by the Contracting Officer. No consideration will be given to partial lists submitted from time to time. Approval of equipment under this provision shall not be construed as authorizing any deviations from the specification, unless the attention of the Contracting Officer has been directed to the specific deviations. Equipment differing from that specified may be proposed, provided the contractor clearly states such differences and provided all essential requirements of the specification are met. If the equipment offered under this provision is, in the opinion of the Contracting Officer, equal to or better than that specified, it will be given consideration.

c. Standards of Underwriters' Laboratories, Inc. - The contractor shall submit proof that the hereinafter specified furnace unit, permanent-type air filters if required, and oil-burning equipment which he proposes to furnish, conform to the standards of the Underwriters' Laboratories, Inc. The label of listing of the Underwriters' Laboratories, Inc., will be accepte as evidence of conforming to this requirement. In lieu of such label or listing, the contractor may submit a written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, that the furnace unit, air filters, and oil-burning equipment have been tested and conform to the standards, including method of test, of the Underwriters' Laboratories, Inc.

26-04. MATERIALS AND EQUIPMENT. - The following materials and equipment shall conform to the respective specifications and other requirements specified below:

a. Aluminum Sheets. - Federal Specification QQ-A-359, temper H12 or H22.

b. Asphalt Varnish. - Federal Specification TT-V-51.

c. Copper Tubing. - Federal Specification WW-T-799, type suited to use intended.

d. Electrical Materials and Appliances. - Section, ELECTRICAL WORK, INTERIOR, of these specifications.

e. Firebrick. - Federal Specification HH-B-671, low-duty.

f. Fire Clay. - Federal Specification HH-C-451, Class C.

g. Galvanized Iron or Steel Sheets. - Federal Specification QQ-S-775, Class D.

h. Gate Valves. - Sizes of 1-1/2 inches or less, Federal Specification WW-V-54, Class A; 2-inch size, Federal Specification WW-V-58, Class A, Designation NS; over 2-inch size, Federal Specification WW-V-58, Class A, Designation OS or OF as required.

i. Mechanical Equipment. - Major items of mechanical equipment shall be of the best quality normally used for the purpose in good commercial practice and shall be the products of reputable manufacturers. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a nameplate securely affixed in a conspicuous place. The nameplate of a distributing agency only will not be acceptable. Belts, pulleys, chains, gears, couplings, projecting set screws, keys, and other rotating parts located so that any person may come in close proximity thereto shall be fully enclosed or properly guarded.

j. Pipe Fittings. - Federal Specification WW-P-521, class as required to match adjacent piping.

k. Pipe Threads. - Federal Specification GGG-P-351.

l. Steel Pipe. - Federal Specification WW-P-406, Type I, Class A, coating as hereinafter specified.

m. Steel Sheets (Uncoated). - Federal Specification QQ-S-636, composition, condition, and finish as best suited for the end use.

n. Unions. - Federal Specification WW-U-531, class as required to match adjacent piping.

26-05. WORKMANSHIP. - Equipment shall be installed in accordance with the recommendations of the manufacturer and the best standard practice for this type of work.

26-06. FURNACE UNIT. - a. General. - The furnace shall have a capacity not less than indicated on the drawings when fired with No. 2 commercial fuel oil. All materials necessary for proper assembly shall be furnished with each furnace. When furnace casings, blowers, motors, and other parts of equipment are shipped unassembled, all parts shall have been made so as to permit field assembly without grinding, drilling, or similar work. The furnace shall fit the space in which it is to be installed so as to allow ample room for maintenance. The furnace shall have combustion spaces designed to withstand possible explosions resulting from delayed ignition of the oil. The unit shall conform to all applicable requirements contained in Commercial Standard CS195, and to the requirements of the Underwriters' Laboratories, Inc.

b. Heat Exchanger. - Heat exchanger shall have a high efficiency of heat transfer between the products of combustion and the circulated air for heating. The gas passages shall be designed to minimize air friction. All seams in the heat exchanger shall be riveted or welded, and the heat exchanger shall be so constructed that the warm air for heating will not be subject to contamination. The heat exchanger shall be designed to allow the metal to expand or contract without causing damage to any part, and shall be constructed of steel and cast iron of suitable composition and weight.

c. Combustion Chamber. - Combustion chamber shall be constructed of firebrick laid in thin fire-clay batter, stainless steel, or other refractory material approved as equal.

d. Cabinet Encasing. - Cabinet encasing the heat exchanger and pan humidifier shall be properly insulated, and protected against corrosion by means of enamel or other suitable protective finish. Galvanized-iron liners forming 1 inch air spaces will be considered as complying with the requirements for insulated cabinets. Cabinets shall be constructed of sheet metal not lighter than 0.0179 in. (26 gage).

e. Supply-Fan Unit. - Supply-fan unit shall have a c.f.m. capacity and external static pressure not less than that indicated on the drawings. The fan unit shall be encased in a rigid housing designed to contain both fan and filters. The external static pressure indicated on the drawings for the fan shall be considered as representing the pressure loss through the ductwork only, and shall be increased adequately to compensate for the loss through the furnace and filters. The fan shall be rated and constructed in accordance with Bulletin No. 110 of the National Association of Fan Manufacturers, Inc. The fan shall be mounted on approved sound-absorbing foundation pads, and shall be practically noiseless in operation. The contractor shall submit printed catalog evidence showing that fan capacity and speed is certified for quiet operation. Impeller wheels shall be the multiblade type, heavily and rigidly constructed. Each wheel shall be supported by two bearings, and shall be accurately balanced both statically and dynamically. Fans may be either directly or indirectly connected to the driving electric motors. V-belt drives shall be designed for at least 50 percent overload capacity. Electric motors shall be an open type, suitable for the available electric service, and provided with thermal-overload protection. Motors shall conform to ELECTRICAL WORK, INTERIOR.

f. Air Filters. - Throw-away type air filters 2 inches thick shall be installed.

26-07. OIL-BURNING EQUIPMENT. - Oil-burning equipment shall include the oil burner, motor, ignition equipment, controls, oil-storage tank, oil pipe and fittings, and all other items necessary for the complete installation of a fully automatic oil-burning heating system. All fuel-oil-burning equipment shall conform to the requirements of the Underwriters' Laboratories Inc., and shall be installed in accordance with Pamphlet No. 31 of the National Board of Fire Underwriters.

a. Oil Burner. - Oil burner shall conform to the requirements of United States Department of Commerce Commercial Standard CS75 when within the scope thereof. The oil burner shall be a mechanical atomization type, suitable for handling No. 2 fuel oil without preheating the oil. The burner shall be quiet in operation, and shall operate with a balanced flame so as not to localize heat in any part of the combustion chamber. The burner shall be capable of completely atomizing and effectively mixing the oil with the air so as to insure complete combustion. The air admitted shall be of sufficient quantity for complete combustion, but not of such quantity as to produce an undue percentage of excess air with the attendant high stack loss.

b. Motor. - The oil-burner motor shall be totally enclosed and shall be provided with thermal-overload protection. The motor shall suit the characteristics of the available electric service and shall conform to ELECTRICAL WORK; INTERIOR. The motor shall have sufficient capacity to operate the oil pump and fan so as to develop 100 percent of the specified furnace rating.

c. Automatic Draft Regulator. - Automatic draft regulator shall be installed in the side of the smoke pipe. The regulator shall consist of a weighted and balanced damper of proper size for the furnace capacity. The damper shall open or close automatically as the chimney draft varies, so as to maintain a constant draft at the furnace outlet.

d. Fuel-Oil Storage Tank. - Fuel-oil storage tank for the water supply intake tower shall have a capacity as indicated on the drawings. Tank shall be constructed in accordance with the standards of National Board of Fire Underwriters Pamphlet No. 31 and certification to that effect shall be furnished to the Contracting Officer, except minimum thickness shall be 7 gauge. The tank shall be provided with welded reinforced threaded openings or flanges for all pipe connections, including oil-fill, vent, and oil-burner connections. A lock fill cap shall be provided with watertight fill box for the tank and shall be installed where indicated or directed. Tank for the flood control operating house is provided under Section, DIESEL ENGINE GENERATOR SET. Piping shall be under this section.

(1) The tank at the water supply intake tower shall be cleaned thoroughly of all loose rust, blisters, loose scale, oil paint of type different from the field primer and other substances that would interfere with the proper adhesion of the protective coating. Mill scale that cannot be removed by hand wire-brushing need not be removed. Oil and grease shall be removed with mineral spirits or other acceptable solvent having a flash point higher than 80°F. After cleaning, the outside of the tank shall be primed and coated with Bitumastic No. 50 or approved equal.

e. Oil Pipe and Fittings. - Oil pipe shall be Type "K" copper tubing with flared joint type compression fittings.

26-08. FUEL OIL GAGE. - The fuel oil gage for the Flood Control Operating House is included under Section 23. The fuel oil gage in the Water Supply Intake Tower shall be of the automatic remote-reading type capable of indicating the amount of fuel oil in the storage tanks. The gage shall be float operated; the motion of the float operating against the bellows of a closed hydraulic system. The indicators shall be mounted on the wall where shown on the drawings and shall have large, easily read scale, graduated in gallons. The flexible hydraulic tubing from the indicator to the float mechanism shall be protected by metallic armor. The connection at the tank shall be protected from physical damage by structural steel box of suitable size. The gage shall be similar and approved equal to "Liquidometer Junior" as manufactured by the Liquidometer Corporation of Long Island City, New York. The contractor shall furnish and install a "Scully" or approved equal vent alarm for the tank.

26-09. CONTROLS. - Controls for each furnace shall consist of a room thermostat, a combination high- and low-limit bonnet thermostat, and a stack switch. The room thermostat shall start or stop the oil burner automatically as the room temperature respectively falls below or rises above the predetermined point. The high-limit bonnet thermostat shall be arranged to take control from the room thermostat and shut off the oil burner whenever the bonnet temperature rises above the predetermined high limit. The low-limit bonnet thermostat, set at approximately 90°F., shall be arranged to cause the supply fan to start and run continuously whenever the bonnet temperature is above the predetermined point. No means independent of the bonnet thermostat shall be provided whereby the circulating fan circuit can be interrupted. A delayed-action stack switch or equivalent device shall be installed to shut off the oil burner automatically in case the oil fails to ignite on starting.

a. Bonnet Thermostats. - Bonnet thermostats shall be an electric type and shall be suitable for operation in conjunction with the supply fan and heat-regulating devices. Bonnet thermostats shall be designed with an approximate high-limit range of from 100°F. to 250°F. with an approximate differential of 25°F., and with an approximate low-limit (fan) range of 50° to 200°F. with a differential of approximately 25°F. The thermostats may be combined as one instrument. Thermostats shall be provided with means of locking the settings. Each thermostat shall be equipped with a flange or other device to provide a space of not less than 1 inch between the sheet metal of the bonnet and the thermostat housing containing the electrical switches.

b. Room Thermostats. - Room thermostats shall be the lock-shield type equipped with thermometers. Thermostats shall be designed to operate on not more than a 3°F. differential over a temperature range of approximately 55° to 85°F. and shall be set to maintain a room temperature of approximately 70°F.

26-10. SMOKE CONNECTIONS. - Each furnace shall be connected to the stack or flue by means of a smoke connection constructed of black iron or steel sheets not less than 0.0478 inch in thickness (18 gage). The clear distance between uncovered smoke connections and combustible material or construction, including plaster on combustible base, shall be not less than 18-inches. The clearance may be reduced to 9 inches where the smoke connection is protected by not less than 1 inch of asbestos or its equivalent or where combustible material in ceilings, beams, or walls is protected by sheet metal or equivalent covering placed at least 1 inch from the surface to be protected and extending the full length of the smoke connection and not less than 12 inches beyond it on both sides. Suitable cleanouts shall be provided which will permit cleaning the entire smoke connection without dismantling.

26-11. FLEXIBLE CONNECTIONS. - Flexible connections of asbestos or glass fabric, to prevent the transmission of vibration through the ducts to the rooms, shall be installed on both the supply and return sides of the heat exchanger, approximately where shown on the drawings. Where the supply fan is installed adjacent to, but separated from the heat-exchanger casing, the flexible connections shall be installed on the intake and discharge sides of the fan unit. Cloth used for flexible connections shall be of proper weight and strength for the service required, and shall be properly filled to be rendered relatively airtight.

26-12. DUCTWORK. - Sheet metal work indicated on the drawings, specified, or required for the heating of the buildings shall be erected in a first-class workmanlike manner, and shall be approved by the Contracting Officer. Ducts, unless otherwise approved, shall be true to the dimensions indicated on the drawings and straight and smooth on the inside, with neatly finished joints. The ducts shall be securely anchored to the building in a manner approved by the Contracting Officer and shall be so installed as to be completely free from vibration under all conditions of operation. The ducts shall be properly braced and reinforced with steel angles or other structural members spaced not more than 60 inches on centers. Slip joints shall be made in the direction of flow, and unless otherwise indicated on the plans, elbows shall have a centerline radius not less than one and one-half times the width of the duct. The sheet metal used shall be galvanized iron or steel, or aluminum. The thickness of the sheet metal shall be not less than 24 gage.

26-13. REGISTERS. - Registers shall be of sturdy construction with adjustable vertical or horizontal deflector vanes set as shown on the drawings or as directed by the Contracting Officer. Suitable key-operated volume dampers shall be provided behind the face of each register.

26-14. ELECTRICAL WORK. - All manual or automatic control and protective or signal devices required for the operation of the heating equipment herein specified and any wiring required but not indicated on the electrical plans shall be furnished and installed under this section of the specifications. Wiring shall conform to ELECTRICAL WORK: INTERIOR. A complete electrical-connection diagram for each piece of mechanical equipment having more than one automatic or manual electrical-control device shall be submitted to the Contracting Officer for approval.

26-15. PAINTING AND FINISHING. - All oil piping, duct hangers, and other uncoated ferrous-metal work in areas having unpainted adjacent surfaces shall be thoroughly cleaned and given one coat of asphalt varnish. All other uncoated ferrous-metal work shall be primed and finish painted as specified in PAINTING.

26-16. OPERATION AND MAINTENANCE INSTRUCTIONS. - Printed instructions, glass-enclosed and framed, covering the operation and maintenance of each item of equipment shall be posted at locations designated by the Contracting Officer. Upon completion of the work, and at a time designated by the Contracting Officer, the services of a competent engineer shall be provided for a period of not less than 1 day to instruct a representative of the Government in the operation and maintenance of the heating systems.

26-17. TESTS. - Upon completion and prior to acceptance of the installation, the contractor shall subject the heating system to such operating tests as may be required by the Contracting Officer to demonstrate satisfactory functional and operating efficiency. Operating tests shall cover a period of 8 hours for each system, and shall include the following specific information in a report, together with conclusions as to the adequacy of the system.

a. Time, date, and duration of test.

b. Outside and inside dry-bulb temperatures.

c. Dry-bulb temperatures entering and leaving air-heating unit.

d. Air quantity in c.f.m. passing through each supply and return register or grille, and supply outlet damper setting.

e. Make, model, and size of each register and grille.

f. C.f.m. of outside air introduced into the system.

g. Supply-fan make, model, and size, r.p.m., static discharge pressure actually obtained, and total c.f.m. handled, as well as voltmeter and ammeter readings for the fan motor during operation.

h. Oil-burner make, model and rated capacity, and ammeter and voltmeter readings for the oil-burner motor.

i. Grade of fuel oil used.

All indicating instruments shall be read at half-hour intervals unless otherwise directed by the Contracting Officer. The report of the test shall be supplied in quadruplicate to the Contracting Officer. The contractor shall furnish all instruments, test equipment and test personnel that are required for the tests, and the Government will furnish the necessary fuel, water, and electricity.

26-18. OPTIONAL CONTROLS. - Pneumatic controls or electronic controls may be provided in lieu of electric controls.

a. Pneumatic Controls. - Where pneumatic controls are furnished, an air compressor of the standard piston type, complete with tank, valves, gages, filters, and other necessary appurtenances shall be provided. All air lines shall consist of suitable tubing with airtight fittings. The air compressor and tank shall be located as directed by the Contracting Officer. The pneumatic control system shall conform to American Standard B19.

26-19. GUARANTY. - The following equipment to be furnished under this section of the specifications shall be guaranteed as specified in the Guarantee paragraph of the SPECIAL CONDITIONS.

Air-heating unit.
Air-supply-fan unit.
Automatic heat-regulating equipment.
Oil burning equipment.

26-20. PAYMENT. - Payment for all work covered under this section, and all costs in connection therewith will be made at the applicable lump sum contract prices for Item No. 83, "Heating System, Water Supply Intake Tower" and Item 78, "Heating and Ventilating Systems, Flood Control Operating House".

SECTION 27

ELECTRICAL-EXTERIOR
(Item 87)

(Index)

Paragraph No.	Paragraph Title	Page No.
27-01	Scope	27-1
27-02	Applicable Publications	27-1
	a. Federal Specifications	27-1
	b. National Bureau of Standards Code	27-1
	c. American Institute of Electrical Engineers Standard	27-1
	d. American Society for Testing Materials Standards	27-2
	e. American Standards	27-2
	f. American Wood Preservers Association Stds.	27-2
	g. Edison Electric Institute Specifications	27-3
	h. National Board of Fire Underwriters Std.	27-3
	i. National Electrical Manufacturers Association Standards	27-3
27-03	General	27-3
	a. Capacities	27-3
	b. Codes	27-3
	c. Conformance with Agency Requirements	27-4
	d. Nameplates	27-4
	e. Prevention of Corrosion	27-4
	f. Standard Products	27-4
	g. Verification of Dimensions	27-5
27-04	Materials	27-5
	a. Bolts and Nuts	27-5
	b. Insulated Wire and Cable	27-5
	c. Conductors	27-7
	d. Conduit	27-7
	e. Crossarms	27-7
	f. Fuses, Power	27-7
	g. Fuse Cutouts, Primary	27-7
	h. Castings	27-7
	i. Connectors	27-8
	j. Ducts	27-8
	k. Fittings, Cable and Conduit	27-9
	l. Lamps, Incandescent	27-9
	m. Mortar	27-9

Paragraph No.	Paragraph Title	Page No.
	n. Outlets, Metal for Conduit	27-10
	o. Potheads	27-10
	p. Guy Strand	27-10
	q. Insulators	27-10
	r. Lightning Arresters	27-10
	s. Poles	27-10
	t. Pole-Line Hardware	27-10
	u. Solderless Connectors and Splices	27-10
	v. Steel, Structural and Miscellaneous	27-10
	w. Transformers, Power and Distribution	27-10
	x. Wood Preservative for Poles and Crossarms	27-10
	y. Zinc Coating for Ferrous Metals	27-10
27-05	Materials	27-11
27-06	Shop Drawings	27-11
27-07	Workmanship	27-11
	a. General	27-11
	b. Qualification of Cable Splicers	27-11
27-08	Duct System	27-11
27-09	Manholes	27-13
	a. General	27-13
	b. Hardware	27-15
	c. Ground Rods	27-15
27-10	Primary Cable Splicers	27-15
	a. Rating	27-15
	b. Cable Splicers	27-15
	c. Installation of Cable	27-16
27-11	Poles	27-16
27-12	Storage and Handling of Poles	27-16
27-13	Pole Setting	27-16
27-14	Crossarms	27-17
27-15	Crossarm Braces	27-17
27-16	Pins	27-17
27-17	Insulators	27-17
	a. General	27-17

Paragraph No.	Paragraph Title	Page No.
27-18	Guys	27-18
27-19	Line Conductors	27-18
27-20	Potheads	27-18
27-21	Pole-Line Hardware	27-19
27-22	Lightning Arresters	27-19
27-23	Distribution Transformers	27-19
	a. Fence-Enclosed Concrete Mat	27-20
27-24	Primary-Fuse Cutouts	27-21
27-25	Secondary Cable System	27-21
	a. Cable Splicers	27-21
	b. Service Connections to Buildings	27-21
27-26	Grounding	27-21
	a. Manhole Grounding	27-21
	b. Transformer-Station Grounding	27-22
	c. Building Grounding	27-22
	d. Lightning-Arrester Grounding Conductors	27-22
27-27	Connections Between Aerial and Underground Sections	27-22
27-28	Connection to Utility Lines	27-22
27-29	Bridge Lights	27-22
27-30	Concrete	27-22
27-31	Tests	27-23
	a. Operating Test	27-23
	b. Ground-Resistance Measurements	27-23
	c. Factory Test Reports	27-23
27-32	Guaranty	27-23
27-33	Payment	27-23

SECTION 27

ELECTRICAL-EXTERIOR
(Item 87)

27-01. SCOPE. - This section covers the installation of the electrical-distribution and bridge lighting systems and duct lines for telephone cables, complete.

27-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

a. Federal Specifications. -

W-C-571b	Conduit and Fittings; Nonmetal, Rigid; (Asbestos-Cement or Fireclay-Cement) (for Electrical Purposes).
W-C-581 & Am-2	Conduit and Fittings; Fiber, Bituminized.
W-C-586	Conduit Outlets (Cast-Iron, Malleable-Iron, and Cast-Aluminum, with Covers and Accessories -- for Shore Use).
W-F-408a	Fittings for Conduit, Metal, Rigid, (Rigid Steel and Electrical Metallic Tubing).
W-S-00610a (GSA-FSS)	Splice, Conductor.
W-T-631a & Am-3	Transformers, Power, Distribution.
FF-B-561a	Bolts, Lag.
FF-B-571a	Bolts; Nuts; Studs; and Tap-Rivets (and Material for Same).
QQ-I-652a	Iron Castings, Gray.
QQ-S-681b & Am-2	Steel; Castings.
QQ-W-336a & Am-3	Wire; Copper, Hard-Drawn.
WW-C-581c & Am-2	Conduit, Electrical, Steel, Rigid, Zinc-Coated.

b. National Bureau of Standards Code. -

H 30	National Electrical Safety Code.

c. American Institute of Electrical Engineers Standard. -

No. 48-1948	Potheads.

d. American Society for Testing Materials Standards. -

A 123-59	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.
A 153-59	Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
D 256-56	Impact Resistance of Plastics and Electrical Insulating Materials.
D 543-56T	Resistance of Plastics to Chemical Reagents.
D 635-56	Flammability of Rigid Plastics over 0.050 Inch in Thickness.
D 638-58T	Tensile Properties of Plastics.
D 648-56	Deflection to Temperature of Plastics Under-Load.
D 696-44	Coefficient of Linear Thermal Expansion of Plastics
D 790-58T	Flexure Properties of Plastics.

e. American Standards. -

C29.8 - 1957 (EEI TDJ-58; NEMA 146-1956)	Wet-Process Porcelain Insulators, (Apparatus-Cap and Pin Type).
C29.9 - 1957 (EEI TDJ-59; NEMA 147-1956)	Wet-Process Porcelain Insulators (Apparatus-Post Type).
C57.12.00-1958 .12.10-1958 .12.20-1959 .12.80,.90-1958 C57.12(Sec. 40)-1957	Distribution, Power, and Regulating Transformers, and Reactors Other than Current-Limiting Reactors, Requirements, Terminology, and Test Code for.
C29.1-1944 (AIEE 41-1944)	Insulator Tests.
C29.2 through C29.7 1955 (EEI TDJ-52 through 57; NEMA 140 through 145-1952).	Wet-Process Porcelain Insulators: Suspension, Spool, strain, Low- and Medium-Voltage Pin, High-Voltage Pin, and High-Voltage Line-Post Types.
05.1-1948	Wood Poles.

f. American Wood Preservers Association Standards. -

C4-59	Preservative Treatment of Poles by Pressure Processes.
C25-57	Preservative Treatment of Cross-arms by Pressure Processes.
P1-54	Creosote.
P8-51	Oil-Borne Preservatives.
P9-58	Petroleum Used in Pentachlorophenol and Copper Naptherate Solutions.

g. Edison Electric Institute Specifications. -

TD-1	Steel Bolts and Nuts.
TD-2	Strand-Eye Anchor Rods.
TD-3	Lag Screws.
TD-4	Eye Bolts.
TD-5	Eyenuts and Eyelets.
TD-6	Steel Cross Arm Braces.
TD-9	Single Tube Seamless Copper Splicing Sleeves.
TD-10	Rolled Steel Washers.
TD-11	Guy Hooks and Guy Strain Plates.
TD-12	Pole Guards.
TD-14	Moulding Staples.
TD-15	Pole and Tower Steps.
TD-16	Line Hardware Materials Inspection Procedure.
TD-17	Bolt Type Steel Insulator Pins with One-Inch Diameter Lead Threads.
TDJ-19	Standard Mounting Bracket for Distribution Cutouts and Distribution Lightning Arresters.
TD-21	Steel Clevises for Guy Strain Insulators.
TD-22	Pole Top Pins.
TD-23	Guy Clamps.
TD-24	Porcelain Wireholders.
TD-90	Douglas Fir Crossarms, Treated or Untreated.
TD-91	Dense Southern Pine Crossarms, Preservative Treated.

h. National Board of Fire Underwriters Standard. -

NBFU No. 70	National Electrical Code (Current Issue).

i. National Electrical Manufacturers Association Standards. -

LA 1-1958	Lightning Arresters.
TR 1-1960	Transformers.
TR 2-1956	Overhead Type Distribution Transformers.
WC 3-1959	Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

27-03. GENERAL. - The contract drawings indicate the extent and general arrangement of the electrical distribution and bridge lighting systems.

a. Capacities. - Capacities of all equipment and material shall be not less than those indicated.

b. Codes. - The installation shall comply with the applicable requirements and recommendations of the National Electrical Code and the National Electrical Safety Code.

c. Conformance with Agency Requirements. - Where materials or equipment are specified to conform to the standards of the Underwriters' Laboratories, Inc., or to be constructed or tested, or both, in accordance with the standards of the National Electrical Manufacturers Association or the American Standards Association, the contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements. The label of, or listing by the Underwriters' Laboratories, Inc., will be acceptable as sufficient evidence that the items conform to Underwriters' Laboratories, Inc., requirements. A certification or published catalog specification data statement to the effect that the item is in accordance with the referenced NEMA standard by a company listed as a member company of NEMA for the section whose standards cover the item under consideration, will be acceptable as sufficient evidence that the item conforms to the requirements of the National Electrical Manufacturers Association. In lieu of such stamp, certification, label or listing, the contractor may submit a written certificate from any nationally recognized testing agency adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements listed hereinbefore, including methods of testing of the specified agencies. Conformance with the agency requirements does not relieve the item from complying with any other requirements of the specifications.

d. Nameplates. - Each major component of equipment shall have as a minimum the manufacturer's name, address, and catalog number, model, style, or type on a plate securely and conspicuously attached to the item of equipment. Nameplates for electrical apparatus shall conform to the referenced NEMA standards.

e. Prevention of Corrosion. - All metallic materials shall be protected against corrosion. Exposed metallic parts of outdoor apparatus shall be given a rust-inhibiting treatment and standard finish by the manufacturer. Aluminum shall not be used in contact with the earth, and where connected to dissimilar metal shall be protected by approved fittings and treatment. All parts such as boxes, bodies, fittings, guards, and miscellaneous parts made of ferrous metals but not of corrosion-resistant steel, shall be zinc-coated in accordance with ASTM A 123 or A 153, except where other equivalent protective treatment is specifically approved in writing by the Contracting Officer. Steel conduits installed underground or under slabs on grade shall be coated with an approved asphaltic paint, plastic coating, or shall be wrapped with a single layer of a pressure-sensitive plastic tape, half-lapped.

f. Standard Products. - Materials and equipment shall be essentially the standard catalog product of a manufacturer regularly engaged in the manufacture of the product, shall meet the requirements of the specification, and essentially duplicate materials and equipment that have been in satisfactory use at least 2 years.

g. Verification of Dimensions. - The contractor shall be specifically responsible for the coordination and proper relation of his work to the site and to the work of all trades. The contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, shall verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

27-04. MATERIALS. - Materials and equipment shall conform to the respective specifications and other requirements specified herein.

a. Bolts and Nuts. - Federal Specification FF-B-571, commercial steel, zinc-coated, type and size as required.

b. Insulated Wire and Cable. - (1) General. - (a) Except as otherwise specified, all wire and cable for power, control and lighting systems shall be single conductor cables, insulated as specified below with either a heat and moisture-resisting or an ozone-resisting grade of insulation and with heavy duty oil resistant thermosetting synthetic compound (Neoprene) jackets, all conforming to the specific requirements specified below.

(b) The conductor size and circuit operating voltage for any particular application or service shall be as indicated on the drawings.

(2) Materials, construction, and tests, unless otherwise specified, shall conform to the applicable requirements of the IPCEA-NEMA Standards Publication No. WC 3-1959, March 1959, entitled, "Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy". Parts, sections, appendices, grades and classes specified hereinafter will refer to the above IPCEA-NEMA standard, unless otherwise stated.

(3) Conductors shall be of tin or lead alloy coated annealed copper wire conforming to all the applicable requirements of Part 2. Conductors shall be solid or stranded as required below.

(a) Power and Lighting Circuits. - 1. Conductors. - Conductors to be insulated for 1000-volt service and below shall have Class B stranding, and conductors to be insulated for 1001-volt service and greater shall have Class C stranding.

2. Strand shielding conforming to the requirements of Paragraph 2.3.2 shall be applied on all conductors insulated for Rated Circuit Voltage (Phase to Phase) of 2000 volts and greater. The tape shall continuously cover the conductor and shall be firmly bonded to the insulation during vulcanization.

(b) Control Circuits. - Conductors shall have Class B or Class C stranding and shall be not smaller than No. 12 AWG.

(4) Insulation. - (a) Material. - Conductor insulation shall be suitable for conductor temperature of not less than 70°C, and, for conductors specified to be insulated for Rated Circuit Voltage of 600 volts and less, shall be either a vulcanized "Synthetic Rubber Heat and Moisture Resisting" grade of insulation or an "Ozone-Resisting Natural or Synthetic Rubber" grade of insulation; and, for conductors specified to be insulated for a Rated Circuit Voltage of 601 volts and greater, shall be an "Ozone-Resisting Natural or Synthetic Rubber or Butyl Rubber" grade of insulation. The "Ozone-Resisting" grade of insulating compounds shall conform to the requirements of Paragraphs 3.14 or 3.15, except that water absorption characteristics of the Ozone-Resisting Natural or Synthetic Rubber grade of insulation (3.14) shall be as follows:

The compound, after a 24-hour immersion, shall show a specific inductive capacity not greater than 4.5; and, after a continuous 14-day immersion, shall show a specific inductive capacity not more than 7 percent higher than the value determined at the end of the initial 24-hour period, nor more than 3 percent higher than at the end of the seventh day.

The "Synthetic Rubber, Heat and Moisture Resisting" grade of insulating shall conform to the requirements of Paragraph 3.13, except that the specific inductive capacity and mechanical water absorption characteristics shall be as follows:

The compound, after a 24-hour immersion, shall show a specific inductive capacity not greater than 5; and, after a continuous 14-day immersion, shall show a specific inductive capacity not more than 10 percent higher than the value determined at the end of the initial 24-hour period, nor more than 3 percent higher than at the end of the seventh day.

The compound, after a 7-day immersion, shall not absorb more than .015 grams of water per square inch of surface exposed to the water.

The manufacturer, in the presence of the Contracting Officer, shall perform tests on samples of the insulation taken from the finished product to determine compliance with the specified requirements. Test procedure shall be in accordance with the applicable requirements of ASTM Standard D470-58T, entitled "Testing Rubber and Thermoplastic Insulated Wire and Cable".

(b) Insulation Thickness. - Thickness of conductor insulation shall be not less than that shown in Part 3, Table 12, Ungrounded neutral, for the respective Rated Circuit Voltages.

(c) Shielding shall be made in accordance with the recommended practice given in Part 4, Table 14, except that single-conductor cables insulated for Rated Circuit Voltage of 3001 and above shall be shielded. The method of accomplishment shall be in accordance with the current practice of the industry.

(5) Jackets. - Over the insulated conductor there shall be applied an outer jacket of an oil-resisting thermosetting synthetic compound conforming to Part 4, Paragraph 4.13.3. Except for shielded wires and cables, the jacket shall be in direct contact and adhere to the conductor insulation. If nonshielded, the jacket thickness shall be as specified in Part 4, Table 26. If shielded, the jacket thickness shall be in accordance with the requirements of Table 28 of the above reference .

(6) Dimensional Tolerance. - The outside diameter of single-conductor wires and cables and multiple-conductor cables shall not vary more than 10 percent and 5 percent, respectively, from the calculated outside diameter based on the thickness, including tolerance, of the component materials specified.

(7) Approval. - Manufacture of the wire or cable shall not be started until all materials to be used in the fabrication of the finished wire or cable have been approved by the Contracting Officer.

(8) Inspection and Tests. - (a) General. - Inspection and tests of wire and cable furnished under these specifications shall be made by and at the plant of the manufacturer, and shall be witnessed by the Contracting Officer, unless waived in writing. All tests and inspections shall conform to the procedure set forth in the applicable specifications or standards referred to herein.

(b) Reports. - Four certified copies of test reports, indicating the results of tests made, shall be furnished the Contracting Officer, and no wire or cable shall be shipped until authorized by the Contracting Officer.

c. Conductors. - Copper-equivalent size indicated on the drawings.

(1) Copper, solid hard-drawn. - Federal Specification QQ-W-336, of size indicated.

d. Conduit. - Rigid steel, Federal Specification WW-C-581.

e. Crossarms. - EEI Specification TD-90 pressure-treated dense or close-grain Douglas fir, or EEI Specification TD-91, pressure-treated dense southern pine, of sizes specified or indicated; pressure treatment shall conform to AWPA C25.

f. Fuses, Power. - NEMA Standard SG 2, and as specified hereinafter.

g. Fuse Cutouts, Primary. - NEMA Standard SG 2 with NEMA Standard 100 mounting brackets where required and as specified hereinafter.

h. Castings. - (1) Cast Iron. - Federal Specification QQ-I-652, class 30.

(2) Cast Steel. - Federal Specification QQ-S-681, class X.

i. Connectors. - Federal Specification W-S-610, and electric power connectors, NEMA Standard SG 1.

j. Ducts. - (1) Asbestos-cement conduit and fittings. - Federal Specification W-C-571. In lieu of the asbestos-cement coupling specified, a fitted plastic or other tough nonmetallic fitted coupling providing a watertight joint may be used.

(2) Bituminized-Fiber Conduit. - Federal Specification W-C-581. In lieu of the fiber coupling specified, a fitted plastic or similar type nonmetallic fitted coupling providing a watertight joint may be used.

(3) Plastic conduit shall be single bore. Conduit and fittings shall be manufactured of materials meeting the chemical and physical requirements specified herein and having the following properties:

Test Method	Property	Value
ASTM D 638	Tensile strength	4,000 p.s.i. minimum
ASTM D 638	Elongation	15 percent minimum
ASTM D 256, Izod notched	Impact Strength	0.8 ft. - lb./in. of notch, minimum
ASTM D 648	Heat distortion 1/2- x 1/2-in. bar	150 degree F. minimum
ASTM D 635	Flammability in./min., 1/8-in. bar	0.55 in./minute maximum
ASTM D 696	Thermal coefficient expansion in./in. per degrees F.	6 by 10^{-5} maximum
ASTM D 790	Flexural strength 1/8 in. bar p.s.i.	No Failure

The conduit and fittings shall be free from all substances that injuriously affect any wire or cable covering such as is used on polychloroprene-sheathed cable. The conduit and fittings shall be corrosion-resistant and not adversely affected by chewing insects and drawing rodents or by acids, alkalies, salts, bacteria, and other organic matters that would be encountered in the ground. When tested in accordance with the applicable provisions of ASTM Standard D 543, the conduit and fittings shall meet the following minimum chemical resistance properties:

Reagent	Test temp. (degrees F.)	Test time (hours)	Max. wt. change (percent)	Change in crushing strength (percent)
Sulfuric acid, 0.1 N.	75	72	0.5	$\nless$ 15
Hydrochloric acid, 0.2 N.	75	72	0.5	$\nless$ 15
Acetic acid, 5 percent	75	72	0.5	$\nless$ 15

Conduit and fittings shall be so joined by means of a special plastic solvent welding cement or other approved method as to provide a watertight and rootproof joint. Type I, light-wall conduit, for use with concrete encasement shall have the following minimum wall thickness for the corresponding size shown below:

Wall Thickness (inch)	Conduit Size (inches)
0.090	2
0.100	3
0.110	3-1/2
0.120	4
0.160	5
0.185	6

Sections cut from the conduit shall be calipered for wall thickness. Conduit and fittings shall be free, within commercial tolerances, of objectionable lines, striations, bubbles, welds, and other manufacturing defects that would impair the service of the conduit. The bore of the conduit shall be straight and circular in cross section with smooth interior surfaces free from obstructions and rough or flaky areas. The conduit length for each size shall be the length that is standard with the manufacturer with a permissible tolerance of 1/4 inch per 10-foot length. The plastic conduit shall meet the detail requirements and tests of Federal Specification W-C-581 for the following properties:

Beam strength
Boiling
Crushing strength
Heat resistance
Impact strength
Resistance to flattening
Tightness of joint, except that the joint shall be made up in the approved manner for plastic conduit with solvent welding cement.
Water absorption

Bends, elbows, and other fittings shall be capable of freely passing a ball that is 1/4-inch less in diameter than the nominal bore of the conduit. Fittings shall be of a type especially made for use with plastic conduit for electrical service.

k. Fittings, Cable and Conduit. - Federal Specification W-F-406 or W-F-408.

l. Lamps, Incandescent. - Federal Specification W-L-101.

m. Mortar. - Mortar shall be composed of the following materials:

(1) Aggregate. - Federal Specification SS-A-281b.

(2) Portland Cement. - Federal Specification SS-C-192d.

(3) Water shall be clean, fresh, and free from injurious amounts of mineral and organic substances.

(4) Mixture shall be in the proportions of one part portland cement to one part sand with sufficient water added to produce a pliable and workable mortar.

n. Outlets, Metal for Conduit. - Federal Specification W-C-586.

o. Potheads. - American Institute of Electrical Engineers Standard No. 48.

p. Guy Strand. - A 218; copper-covered steel, American Standard C7.18.

q. Insulators. - American Standards C29.1 through 29.9 inclusive, as applicable and specified hereinafter.

r. Lightning Arresters. - NEMA Standard LA 1, with NEMA Standard mounting bracket where required and as specified hereinafter.

s. Poles. - American Standard O5.1, machine trimmed by turning, pressure-treated in accordance with AWPA Standard C4; creosote conforming to AWPA Standard P1, and oil-borne preservatives and petroleum conforming to AWPA Standards P8 and P9. Pressure treatment of northern white cedar shall be as specified for western red cedar; pressure treatment of western fir and western hemlock shall be as specified for Douglas fir.

t. Pole-Line Hardware. - Zinc-coated, EEI Specifications TD-1 through TD-24, inclusive, except 8, 13, 18, and 20; steel hardware material, ASTM Standard A 107.

u. Solderless Connectors and Splices. - Federal Specification W-S-610, type, class, style, and size as indicated or required.

v. Steel, Structural and Miscellaneous. - ASTM Standard A 7 or A 107.

w. Transformers, Power and Distribution. - NEMA Standard TR 1, American Standards C57.12 and C57.12c, and Federal Specification W-T-631.

x. Wood Preservative for Poles and Crossarms. - AWPA P1, P8, and P9.

y. Zinc Coating for Ferrous Metals. - ASTM Standard A 123 or A 153.

27-05. MATERIALS LIST. - As soon as practicable, and before starting installation of any materials or equipment, the contractor shall submit to the Contracting Officer for approval a complete list, in six copies of materials and equipment to be incorporated in the work. This list shall include manufacturer's style or catalog numbers. Cuts or other descriptive data shall be furnished when required by the Contracting Officer. No consideration will be given to partial lists submitted from time to time. Approval of materials will be based on manufacturer's published data, approval of materials and equipment will be tentative subject to submission of complete shop drawings indicating compliance with the contract documents.

27-06. SHOP DRAWINGS. - After receiving tentative approval of the equipment on the material lists and before installation of any of these items, the contractor shall submit complete shop drawings and such other descriptive data as the Contracting Officer may require to demonstrate compliance with the contract documents. Shop drawings shall be submitted for the following items and such other items as the Contracting Officer may direct:

Transformer Pad
Transformers

If departures from the contract drawings are deemed necessary by the contractor, details of such departures, including changes in related portions of the project and the reasons therefor, shall be submitted with the shop drawings. Approved departures shall be made at no additional cost to the Government.

27-07. WORKMANSHIP. - a. General. - All materials and equipment shall be installed in accordance with the recommendations of the manufacturer as approved by the Contracting Officer to conform with the contract documents. The installation shall be accomplished by workmen skilled in this type of work.

b. Qualification of Cable Splicers. - Before assigning any cable splicer to work covered by this specification, the contractor shall provide the Contracting Officer with the names of the cable splicers to be employed, together with satisfactory proof that each splicer has had at least 3 years experience in splicing high-voltage cables and is experienced with the type and rating of cables to be spliced. In addition, each cable splicer may be required to make an approved dummy splice in the presence of the Contracting Officer in accordance with cable manufacturer's instructions, before the splicer is approved to splice cable covered by this specification. All material for dummy splices shall be furnished by the contractor.

27-08. DUCT SYSTEM. - a. General. - The duct system shall consist of single round-bore conduit. The number and size of the duct shall be as indicated. Duct lines shall be laid to a minimum grade of 4 inches per 100 feet. Grade may be from one manhole to the next or both ways from a high point between manholes, depending on the contour of the finished grade. Duct lines shall be installed so that the top of concrete in encased duct lines is not less than 18 iches below. Changes in direction of runs exceeding a total of 10 degrees, either vertical or horizontal, shall be accomplished by long sweep bends having a minimum radius of curvature of 25 feet, except that manufactured bends may be used at ends of short runs of 100 feet or less, and then only at or close to the end of the run. The long sweep bends may be made up of one or more curved or straight sections and/or combinations thereof. Manufactured bends shall have a minimum radius of 18 inches for use with ducts of less than 3 inches in diameter and a minimum radius of 36 inches for ducts of 3 inches in diameter and larger. Conduits shall terminate in end bells where duct lines enter manholes. Conduit shall be thoroughly cleaned before using or laying. During construction and after the duct line is completed, the ends of the conduits shall be plugged to prevent water washing mud into the conduits or manholes. Particular care shall be taken to keep the conduits clean of concrete, dirt, and any other substance during the course of construction. Where it is necessary to cut a tapered end on a piece of conduit at the site, the cut shall be made with a tool or lathe designed to cut a taper to match the taper of the particular conduit being used. After the duct line has been completed, a standard flexible mandrel not less than 12 inches long, having a diameter approximately 1/4-inch less than the inside diameter of the conduit, shall be pulled through each conduit, after which a brush with stiff bristles shall be pulled through each conduit to make certain that no particles of earth, sand, or gravel have been left in the line. Pneumatic rodding may be used to draw in the lead wire. Where connection is made to an existing duct that is of different material and shape than the duct line being installed, a suitable coupling of a type recommended by the duct manufacturer shall be used. Conduits shall be stored to avoid warping or deterioration. Plastic conduit shall be stored on a flat surface and protected from the direct rays of the sun. Conduit joints in concrete encasement may be placed side by side horizontally but shall be staggered at least 6 inches vertically.

b. Materials. - (1) Duct Banks shall consist of type I fiber, asbestos-cement, plastic, conduit, at the option of the contractor. The type of conduit shall not be mixed. Cables for the telephone system will be installed by others.

c. Installation of Duct Banks. - (1) Duct banks comprising type 1 single conduits. - (a) General. - Each single conduit of the duct bank shall be completely encased in concrete as indicated on drawings. The thickness of concrete encasement shown on drawings is the minimum thickness, and may be increased to fit the actual shape of the trench. Separators or spacing blocks shall be made of concrete, plastic, or other suitable nonmetallic nondecaying material placed on not greater than 4-foot centers. Joints in conduits shall be staggered at least 6 inches. Ducts shall be securely anchored to prevent movement during the placing of concrete. A bare copper cable not smaller than No. 2/0 AWG shall be installed in each duct bank.

d. Installation of Couplings. - (1) General. - All types of conduit joints shall be made up in accordance with the manufacturer's recommendations for the particular conduit and coupling selected and as approved by the Contracting Officer. In the absence of specific recommendations, the various types of conduit joint couplings shall be made watertight by the following method(s) as appropriate:

(a) Asbestos cement and fiber. - The tapered ends or joints of asbestos cement and fiber, conduit, except where plastic couplings are used, shall be swabbed with bituminous or joint-sealing compound before the coupling is applied, if recommended by the manufacturer to insure a watertight joint. If a plastic or nonmetallic coupling is used, it shall be tightly driven onto the conduit. Due to the brittleness of plastic couplings at low temperatures, such couplings will not be installed when temperatures are below 0 degrees F. The couplings shall be warmed in hot water, or by another approved method when installing in temperatures below 32 degrees F.

(b) Plastic conduit joints shall be made up by brushing a plastic solvent cement on the inside of a plastic coupling fitting and on the outside of the conduit ends. The conduit and fitting shall then be slipped together with a quick one-quarter-turn twist to set the joint tightly.

e. Concrete shall conform to Section "Concrete". Duct lines shall be of monolithic construction. Where a connection is made to an existing duct line, the concrete encasement shall be well bonded or doweled to the existing encasement.

27-09. MANHOLES. - a. General. - Manholes shall be constructed approximately where shown. The exact location of each manhole shall be determined after careful consideration has been given to the location of other utilities, grading and paving. The location of each manhole shall be approved by the Contracting Officer before construction of the manhole is started. Manholes shall be the type noted on the layout drawings and shall be constructed in accordance with the applicable details shown on the drawings. Concrete shall conform to Section, "CONCRETE". Frames and covers shall be made of gray cast iron. A machine-finished seat shall be provided to insure a perfect joint between the frame and cover. Frames and covers shall be delivered on the job unpainted and, after inspection and approval by the Contracting Officer, shall be given two coats of asphalt paint. In paved areas, the top of manhole covers shall be flush with the finished surface of the paving. In unpaved areas, the top of manhole covers shall be approximately 1/2-inch above the finished grade. Where existing grades that are higher than finished grades are encountered, a sufficient number of courses of brick shall be installed between the top of manhole and manhole frame to elevate temporarily the manhole cover to existing grade level. Where duct lines enter manholes, the sections of duct may be either cast in the concrete or may enter the manhole through a square or rectangular opening of suitable dimensions provided in the manhole walls. Where openings are provided for the entrance of duct lines, the space between ducts and manhole walls shall be calked tight with joint sealing compound, synthetic rubber calking compound.

(1) Joint Sealing Compound. - (a) The entire quantity of sealing compound proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at the source of supply, sufficiently in advance of need to allow 30 days for testing. Sampling and testing will be done by the Government in accordance with referenced specification. The contractor shall provide all required samples. The cost of the first test will be borne by the Government. If the sample fails to meet the specification requirements, the material represented by the sample shall be replaced, and the cost of retesting will be deducted from the payments due the contractor at the rate of $100 per sample retested.

(2) Sealing Compound. - Sealing compound shall conform to Federal Specification TT-S-00227, Class B, color as selected by the Contracting Officer.

(3) Rope Yarn. - Rope yarn shall be the raveled strands of rope fiber free from oil or other staining element.

(4) Preparation. - Grooves in concrete shall be cut and thoroughly cleaned out to a minimum depth and width indicated without damage to adjoining work; however, the depth of joint shall be at least equal to the width, not less than 1/4-inch. Where necessary to provide a suitable backstop, the back of grooves shall be packed tightly with rope yarn or other approved items. All particles of mortar, dust, and other foreign matter shall be brushed out just prior to sealing; all grease, shall be removed and surfaces shall be dry prior to application of calking compound. Primer shall be used as recommended by the manufacturer of the compound.

(5) Sealing Compound. - Sealing compound shall be installed where specified above. The compound shall not be applied when the temperature is under 40°F. Compound shall be applied with open end using open-end type calking gun, using a nozzle of proper size to fit the joint width and shall be forced into grooves with sufficient pressure to expel all air and fill the groove solidly. Application shall begin at bottom and work upward. Compound shall be uniformly smooth and free of wrinkles, and unless otherwise noted, shall be left sufficiently convex to result in a flush joint when dry.

(6) Cleaning. - Equipment shall be cleaned with toluene, tylene or similar solvent.

b. Hardware. - (1) Electric Manholes. - Cables shall be well supported on walls by hot-galvanized cable racks equipped with adjustable hooks and insulators. The number of cable racks indicated shall be installed in each manhole and not less than two spare hooks shall be installed on each cable rack. Insulators shall be made of best-quality, high-glazed porcelain. Insulators will not be required on spare hooks. A cable-pulling iron shall be installed in the wall opposite each duct line entrance into the manhole.

(2) Communications Manholes. - The number of cable racks indicated shall be installed in each telephone manhole. Each cable rack shall be provided with two cable hooks. A cable-pulling iron shall be installed in the wall opposite each duct line entrance into the manhole. Cables for the telephone and communication systems will be installed by others.

c. Ground Rods. - In each electric manhole, at a convenient point close to the wall, a 3/4-inch copper or copper-clad-steel ground rod shall be driven into the earth not less than 6 feet before the manhole floor is poured. The ground rod shall extend approximately 4 inches above the manhole floor.

27-10. PRIMARY CABLE SYSTEM. - a. Rating. - Primary cable system shall consist of neoprene jacketed cable, conforming to Subparagraph "Insulated Wire and Cable". The size and number of conductors and the number of cables shall be as indicated. Cables larger than No. 8 AWG shall be stranded. Cables shall have a voltage rating of at least 15,000 volts, grounded neutral. Primary cable shall be installed in duct lines. Loads shall be divided as evenly as practicable on the various phases of the system.

b. Cable Splicers. - Cable splicers shall be made by qualified cable splicers in strict accordance with the recommendations of the cable manufacturer. A copy of the manufacturer's recommendations shall be furnished to and approved by the Contracting Officer. Splices in neoprene-jacketed cable shall provide insulation and jacket equal in every respect to that of the cable. In order to prevent the possibility of moisture entering between the insulation and jacket, preparation for splices in neoprene jacketed cable shall include cutting the jacket back sufficiently to provide at least 1 inch of exposed conductor insulation between the sleeve connector and the tapered end of the neoprene jacket. In splicing neoprene jacketed cable, special care shall be taken to insure that all wax is removed from the section to be covered with splicing tape. Shielding tape shall be applied to splices in shielded cables as required to continue the shielding through the entire splice. Unless otherwise indicated, primary cable shall terminate in potheads of proper characteristics for the system. In filling potheads at cable terminals, the cable manufacturer's recommendations shall be carefully followed in order to insure the use of a compound that will not injure the cable insulation or jacket.

c. Installation of Cable. - (1) In duct lines. - Cable splices shall be made in the manholes only. Each circuit shall be identified by means of nonferrous-metal or fiber tags or approved equal, in each manhole, and at each terminal.

27-11. POLES. - Poles shall be pressure-treated wood: southern pine, Douglas fir, ponderosa pine, jack pine, lodgepole pine, red pine, western fir, western hemlock, western red cedar, or northern white cedar at the option of the contractor. Poles shall be of the length and class indicated, except that longer poles shall be provided where necessary to maintain the minimum vertical clearances required by the National Electrical Safety Code after final unloaded sagging. All clearances specified by the National Electrical Safety Code shall be maintained. Footnote reductions to tables shall not apply and clearances shall not be reduced except where authorized in writing by the Contracting Officer. Pole markings shall be located approximately 10 feet from the butt of the pole, except where other locations standard with the pole manufacturer are approved. Poles shall be turned smooth full length, and shall be roofed, gained, and bored prior to pressure treatment. Sweeps and short crooks of poles in line shall not exceed 50 percent of the maximum permitted by the applicable American Standard.

27-12. STORAGE AND HANDLING OF POLES. - Poles held in storage for more than 2 weeks shall be stored in accordance with American Standards. The handling of poles shall be in accordance with American Standards except that pointed tools capable of producing indentations more than 1-inch in depth shall not be used.

27-13. POLE SETTING. - In normal firm ground, minimum pole-setting depth shall be 5'-0" below grade. In rocky or swampy ground, pole-setting depths shall be respectively decreased or increased in accordance with local power company, as published standards and as approved by the Contracting Officer. In swampy ground, a bog shoe may be used. Poles in straight runs shall be in a straight line. Curved poles shall be placed with the curvature in line with the lead. Poles shall be set to maintain as even a grade as practicable. When the average ground run is level, consecutive poles shall not vary more than 5 feet in height. When the ground is uneven, poles differing in length shall be kept to a minimum by locating poles to avoid the highest and lowest ground points. If it becomes necessary to shorten a pole, a piece shall be sawed off the top end. If poles are shortened after treatment, the shortened end of the pole shall be given an application of hot preservative. Where poles are set on hilly terrain, along the edge of cuts or embankments, or where the soil may be washed out, special precautions shall be taken to ensure durable foundations, and the setting depth shall be measured from the lower side of the pole. Holes shall be dug large enough to permit the proper use of tampers to the full depth of the hole. Earth shall be thrown into the hole in 6-inch maximum layers, then thoroughly tamped before the next layer is thrown in. Surplus earth shall be placed around the pole in a conical shape and packed tightly to drain water away from the pole.

27-14. CROSSARMS. - Crossarms shall conform to details shown on drawings. Climbing space, wire clearances, and vertical and longitudinal strength of crossarms shall conform to the National Electrical Safety Code. Crossarms shall be straight and free of twists to within 1/10 inch per foot of length. Bend or twist shall be in one direction only. Crossarms shall be machined, chamfered, trimmed, and bored for all pins and bolts required before pressure treatment. Double crossarms shall be provided at dead ends, at angles, and corners and elsewhere as required to provide adequate vertical and longitudinal strength. Double crossarms shall be securely held in position by means of 1/2-inch double-arming bolts. Each double-arming bolt shall be equipped with four nuts and four square washers. Crossarms shall be bolted to poles with 5/8-inch through-bolts with square washers at each end. Bolts shall extend not less than 1/8 inch through bolts with square washers at each end. Bolts shall extend not less than 1/8 inch nor more than [illegible] inches beyond the nut.

27-15. CROSSARM BRACES. - Crossarm braces shall be provided on all crossarms and shall be zinc-coated structural steel in conformance with ASTM Standard A 7 or A 107. Flat braces shall be 1/4-inch by 1-1/4 inches, not less than 28 inches long. Flat braces shall be bolted to arms with 3/8-inch carriage bolts with round washer between bolthead and crossarm, and secured to poles with 1/2- by 4-inch lag screws after crossarms are leveled and alined.

27-16. PINS. - a. Metal pins shall be zinc-coated forged steel with lead thread height to suit the insulator provided, but not less than 4-1/2 inches high by 5/8-inch diameter. Shoulder shall be not less than 2-inch diameter, designed to distribute load uniformly to the crossarm. Shank shall be not less than 5/8-inch diameter by 5-3/4 inch length, equipped with 2-inch square washer, nut, and locknut, and shall project not less than 1/8-inch nor more than 2 inches beyond locknut.

27-17. INSULATORS. - a. General. - Insulators for use on primary distribution system shall conform to the American Standards Nos. C29.2, C29.4, C29.5, C29.6, or C29.7, as applicable for the installation, with testing in accordance with ASA Standard C29.1. Suspension-type insulators shall be used on the primary system at corners and angles, for suspended buses, at dead ends, and wherever else pins do not provide adequate strength. Mechanical strength of suspension and strain insulators shall exceed the ultimate strength of the conductor or guy attached thereto. Insulators for various uses shall have ratings not lower than the classes indicated in Table 2:

TABLE 2

Minimum rating of insulators in terms of class

Service	Pin	Line Post	Suspension	Guy Strain
15,000V. and below	55-5	57-1L011S	52-4	54-2

27-18. GUYS. - Guys shall be provided at the locations, with leads and strengths indicated on the drawings, and elsewhere as required wherever conductor tensions are not balanced, as at angles, corners, dead ends, and in conformity with the National Electrical Safety Code H30. Guys shall be as shown on drawings. Where guys are wrapped around poles, at least two guy hooks shall be provided and pole shims shall be provided where guy tension exceeds 6,000 pounds. Three bolts or offset-type guy clamps or approved guy grips shall be provided at each guy terminal. Anchors shall be rock anchors when installed in rock, installed at right angles to the guy; elsewhere anchors shall be of an approved expanding type. All guy anchors and attachments shall provide a strength exceeding the required guy strength. Thimbles or thimble-eyes shall be provided on all anchor rod and eye-bolt guy attachments to protect the strand. An approved half-round steel guy protector, not less than 8 feet long, shall be provided at the anchor of each guy, securely clamped to the guy or anchor at bottom and top. When field conditions prevent the indicated guy lead, anchors shall be placed in a location approved by the Contracting Officer, and the guy strength increased by the ratio of the sine of the lead angle indicated to the sine of the lead angle provided, except that the lead angle shall be not less than 15 degrees. Guy strand shall be 7 strand, class 30 HS or 30-EHS copper-covered steel, with a breaking strength not less than 6,000 pounds.

27-19. LINE CONDUCTORS. - Line conductors for primary shall be bare hard-drawn copper of the sizes indicated on the drawings. Splices under tension shall be mechanically and electrically secure with a strength not less than the conductor. Splice materials, sleeves, fittings, and connectors shall be noncorrosive and shall not adversely affect the conductor with which they are used. Conductors shall be tied to insulators in an approved manner. Tie wires for copper conductors shall be soft-drawn copper No. 8 for No.6 line conductors, No. 6 for No. 4 and No. 2 line conductors. All dead ends shall be made with approved clamps designed for the purpose, with a strength not less than the conductor. Care shall be taken in handling and stringing of conductors to guard against cuts, scratches, and kinks. Conductors shall not be drawn over rough or rock ground, nor around sharp bends. When drawn by machine power, conductors shall be drawn from the mounted-reel through approved stringing sheaves in approximately straight lines and clear of all obstructions. A climbing space at least 48 inches square shall be provided. Initial stringing sags and tensions shall be as indicated, or in accordance with approved tables for the conductor furnished by the contractor, provided indicated clearances are maintained.

27-20. POTHEADS. - Potheads shall be the hermetically sealed capnut type and shall be suitable for conductors of the gage and type used. Potheads for three conductor cables shall have cast iron bells or bodies. Bell caps or lids of multiple conductor and bodies of single-conductor potheads may be cast iron for cables up to 250 MCM or 250 amperes, and shall be cast brass or aluminum or other nonmagnetic metal for cables larger than 250 MCM or 250 amperes. Insulators shall be made of glazed wet-process electrical porcelain of the indoor or outdoor type as required. Cable-entrance sealing fittings shall be positive-sealed stuffing boxes for nonleaded cables, for single-conductor cables. Potheads shall be properly filled with insulating compound which shall be heated and poured at the correct temperature insured by the use of a thermometer, all as recommended by the pothead manufacturer. Pothead voltage ratings shall be 15,000 volts. The standard Withstand-Test Voltages of the assembled potheads shall conform to AIEE Standard No. 48.

27-21. POLE-LINE HARDWARE. - Pole-line hardware shall be hot-dip-galvanized. Suitable washers shall be installed under bolt heads and nuts on wood surfaces. Washers used on through-bolts and double-arming bolts shall be approximately 2-1/4 inches square and 3/16-inch thick. The diameter of holes in washers shall be the correct standard size for the bolts on which the washers are used. Washers for use under the heads of carriage bolts shall be of proper size to fit over the square shank of the bolt. Eyebolts, bolt eyes, eyenuts, strain-load plates, lag screws, guy clamps, fasteners, hooks, shims, and clevises shall be used wherever required to adequately support and protect the poles, crossarms, guy wires, and insulators.

27-22. LIGHTNING ARRESTERS. - Lightning arresters shall be provided at all aerial-to-underground connections, and transformers. Selection of arrester ratings and classification according to use shall be as described by NEMA LA 1. Arresters shall be equipped with suitable mounting brackets for the applicable method of mounting. Arresters shall be connected by means of a soft-drawn-copper conductor, not lighter than No. 6 AWG, to a copper or copper-clad-steel ground rod not less than 3/4-inch in diameter, or its equivalent. The ground rod shall be driven at least 8 feet into the ground approximately 3 feet out from the base of the pole. After installation is completed, the top of the ground rod shall be approximately 1 foot below finished grade. The total ground resistance shall not exceed 25 ohms. Ground resistance shall be measured in normally dry conditions not less than 48 hours after rainfall. The ground conductor shall be protected by half-round wood, plastic, or fiber molding from the ground line to a point at least 8 feet above the ground line and throughout the communication and transformer spaces. The wood plastic or fiber molding shall be stapled to the pole at intervals not exceeding 2 feet, with one staple not more than 3 inches from each end. Single-point serrated staples of a type suitable for use with the plastic or fiber molding shall be used for stapling molding to the pole. Where ground conductor is not covered by molding, it shall be stapled to the pole at intervals not exceeding 2 feet. All connections shall be made with solderless connectors except where solder-type lugs are furnished on the equipment.

27-23. DISTRIBUTION TRANSFORMERS. - Distribution transformers shall be of the type I, mineral-oil-insulated, two winding type, and in accordance with the requirements hereinafter stated. Transformers shall be suitable in every respect for outdoor installation and rated as indicated. Power and distribution transformers shall be products of a manufacturer who has produced units of the same type, rating and voltage as required for this project, within the 2-year period preceding the date of the invitation for bids, which have operated satisfactorily for at least 1 year prior to date of the invitation for bids. Evidence showing such production and satisfactory performance and proved reliability of the product shall be promptly submitted to the Contracting Officer upon request therefor. All transformers shall be provided with rated kv.-a. NEMA standard taps. Where taps are not required under the NEMA standards, transformers shall have two 2-1/2 percent rated kv.-a. high-voltage taps above and below rated primary voltage. High-voltage bushings shall be of the tank-wall type. The high-voltage winding of each transformer shall be given a production-line-impulse test. The production-line-impulse test and detection means shall meet the following minimum requirements: (a) one full-wave test at American Standard wave shape and at a voltage magnitude not less than that specified for the specific voltage class in American Standard C57.12, table 12-02. 110a, column 7, for distribution levels, and (b) detection shall be made by observation of an oscilloscope or by means of automatic electronic circuits, provided sufficient data are available on essentially duplicate transformers to show that the circuits are sufficiently sensitive to detect impulse failures within the windings. In lieu of the preceding tests, the contractor may elect a substitute standard impulse test procedure in accordance with American Standard C57.12-06.215 using detection methods as given in American Standard C57.12-92.600; however, if this election is made, tests shall be conducted on one transformer of each group of six or less transformers of the same rating being furnished under this contract. The high-voltage winding of each transformer rated above 167 kv.-a. shall be impulse tested in conformance with NEMA Standard TR 1. Prior to final acceptance of the transformers by the Contracting Officer, the contractor shall submit for approval the manufacturer's or a recognized independent testing laboratory's test reports in duplicate, similar to those covered in NEMA Standard TR 1, and as required above. The average sound level in decibels of the transformers for indoor installations shall be guaranteed not to exceed the values given in Table III of NEMA Standard TR 1. Transformer tank shall have a standard gray finish. Transformer installations shall include one primary fuse cutout and one lightning arrestor for each ungrounded phase conductor. All accessories for each installation shall conform to the applicable NEMA standards and shall be suitable in every respect for the intended service. Each transformer shall have its kv.-a. rating conspicuously displayed on its tank.

a. Fence-Enclosed Concrete Mat. - Transformers shall be mounted on a fence-enclosed concrete mat. Mat select gravel and crushed stone shall be provided as indicated. Fence shall be of the chain-link type and shall conform to requirements covering "Chain Link Fencing 7 Feet" as specified in Section, MISCELLANEOUS WORK. An entrance gate with catch and padlock shall be provided in the fence where indicated on the drawings or where directed by the Contracting Officer. Porcelain-enameled steel or approved equal, high-voltage-warning signs shall be fastened to each side of the fence, approximately 5 feet above the ground.

27-24. PRIMARY-FUSE CUTOUTS. - Primary-fuse cutouts shall be heavy duty, porcelain-enclosed indicating non-dropout type, rated 7.8 k.v. Fuse ratings shall be equal to approximately 150 percent of the transformer full-load rating, or shall be as indicated on the drawings and coordinated to the transformers provided.

27-25. SECONDARY CABLE SYSTEM. - Secondary cable system shall consist of 600-volt neoprene-jacketed cable, as specified under "Insulated Wire and Cable". The size and number of conductors and the number of cables shall be as indicated. Conductors larger than No. 8 AWG shall be stranded. Each circuit shall be identified by means of fiber or nonferrous-metal tags, or approved equal, in each manhole, each junction box, and at each terminal. Secondary cable shall be installed in conduit. Top of conduit shall be at least 2 feet below finished grade.

a. Cable Splices. - Cable splices shall be made in strict accordance with the cable manufacturer's recommendations. A copy of the manufacturer's recommendations shall be furnished to the Contracting Officer for inspection purposes. Splices in neoprene jacketed cable shall provide insulation and jacket equal in every respect to that of the cable. In order to prevent the possibility of moisture entering between the insulation and the jacket, preparation for splices in neoprene-jacketed cable shall include cutting the jacket back sufficiently to provide at least 1 inch of exposed conductor insulation between the sleeve connector and the tapered end of the polychloroprene jacket. In splicing neoprene-jacketed cable, special care shall be taken to insure that all wax is removed from the section of cable jacket to be covered with splicing tape.

b. Service Connections to Buildings. - Service cables shall be extended into the various buildings as indicated, and shall be properly connected to the main service equipment.

27-26. GROUNDING. - Grounding shall conform to applicable requirements in the National Electrical Code, the National Electrical Safety Code, or herein. Neutral conductors, metallic conduits, pothead bodies, junction boxes, lightning arresters, fence enclosures, and all non-current-carrying metallic parts of equipment, shall be grounded.

a. Manhole Grounding. - Cable racks installed in the electrical-distribution-system manholes shall be properly connected to the No. 2/0 continuous grounding conductor by means of No. 4 AWG uninsulated stranded copper cable. Connection to ground cable shall be by means of bolted-clamp terminals or approved molded fusion-weld process. The ground wire shall be neatly and firmly attached to the manhole walls.

b. Transformer-Station Grounding. - Transformer-station grounding shall be as indicated on drawings. A bare copper cable not smaller than No. 2/0 AWG shall be installed not less than 24 inches below grade connecting to the equipment, and the fence. Fence and equipment connections shall not be smaller than No. 2/0 AWG. Ground connections shall be made by solderless lugs, or shall be welded by an approved molded fusion process.

c. Building Grounding - A bare copper cable not smaller than No. 2/0 AWG shall be installed in each service conduit and shall connect to the continuous grounding cable in the manholes. Non-current-carrying metal parts of electric equipment shall be effectively grounded by connection to the bus. The ground bus shall be connected to the lighting system neutral, 2/0 continuous grounding-cable and water-service. Ground conductors shall be copper wire, cable, or bus bar of the type and size as indicated, or as required by National Electrical Code. Ground conductors shall be installed in a neat and workmanlike manner and shall be securely held in place by means of straps placed at proper intervals. Connections and splices in the grounding system shall be made by means of solderless connectors, except where solder-type lugs are furnished on equipment.

d. Lightning-Arrester Grounding Conductors. - Lightning-arrester grounding conductors shall be bonded to the No. 2/0 AWG continuous grounding cable. Ground conductors shall be not smaller than No. 2/0 AWG for distribution-class arresters. Ground connections shall be made with solderless connectors or approved molded fusion-weld process. When the installation is complete and all grounding "groups" are bonded together the complete system should measure no more than 15 ohms. If this value cannot be reached the Contracting Officer shall be contacted for further instructions. Additional ground rods shall be used, in the area of the riser pole, if required to establish an effective ground and payment for these additional rods will be made under Item "Miscellaneous Metals".

27-27. CONNECTIONS BETWEEN AERIAL AND UNDERGROUND SECTIONS. - Where the system changes from aerial to underground, the underground cable shall be extended up the pole in rigid conduit, to the crossarm and shall terminate in single-conductor capnut-type outdoor potheads, as shown on drawing.

27-28. CONNECTION TO UTILITY LINES. - The contractor shall coordinate the work with the Huntington Electric Light Company and shall provide for final connection to the lines of the power company at no additional cost to the Government.

27-29. BRIDGE LIGHTS. - Bridge lighting units on aluminum standards shall be furnished and installed on the bridges or at the entrances thereto as shown on the drawings.

27-30. CONCRETE. - Concrete work shall conform to the requirements of Section CONCRETE.

27-31. TESTS. - a. Operating Test. - After the installation has been completed, and at such time as the Contracting Officer may direct, the contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this section of the specifications. The test shall be performed in the presence of the Contracting Officer. The contractor shall furnish the necessary instruments and personnel required for the test, and the Government will furnish the necessary electric power.

b. Ground-Resistance Measurements. - Ground-resistance measurements of each group of ground rods shall be taken and certified by the contractor to the Contracting Officer. The contractor shall submit in writing to the Contracting Officer upon completion of the project, the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system, as well as the resistance and soil conditions at the time the measurements were made. When the building water service is used as a ground or part of the grounding system, ground-resistance measurements shall also be made of this connection. Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds.

c. Factory Test Reports. - Factory test reports on equipment, including the impulse tests specified for transformers, shall be certified by the manufacturer or testing laboratory and furnished by the contractor to the Contracting Officer.

27-32. GUARANTY. - The following equipment furnished under this section of the specifications shall be guaranteed in accordance with the guaranty provisions of the SPECIAL CONDITIONS:

Cable and wire, 5,000 volts and above
Lightning arresters
Primary fuse cutouts
Potheads
Bridge lights
Transformers

27-33. PAYMENT. - No separate payment will be made for the work covered under this section, and all costs in connection therewith, including concrete, cement, reinforcement steel, and transformer pen shall be included in the lump-sum contract price for Item No. 87, "Exterior Electrical Work".

SECTION 28

STRUCTURAL STEEL BRIDGES
(Items 75 and 76)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
28-01	General	28-1
28-02	Materials and Workmanship	28-1
	a. General	28-1
	b. Structural Steel	28-1
	c. Shear Connectors	28-1
	d. Bridge Bearing Pads	28-1
	e. Miscellaneous	28-2
28-04	Design	28-2
28-05	Workmanship	28-2
	a. Connections	28-2
	b. Holes	28-2
	c. Nuts	28-2
28-06	Erection	28-3
	a. Driftpins	28-3
	b. Gas Cutting Torch	28-3
	c. Preparation of Bearing Area	28-3
28-07	Painting	28-3
28-08	Payment	28-3

SECTION 28

STRUCTURAL STEEL BRIDGES
(Items 75 and 76)

28-01. GENERAL. - The steel for the Service and Access Bridges, complete, with structural steel shapes, steel bearings, plates, expansion plates, bars, shear connectors, and all necessary welding, and other fastenings, shall be constructed in accordance with these specifications and with details, sizes, and dimensions and at the locations shown on the drawings.

28-02. MATERIALS AND WORKMANSHIP. - a. General. - Materials shall conform to the applicable requirements indicated in this paragraph and the workmanship to Section 31 and as further specified in this paragraph. Fabrication, delivery, storage and erection shall conform to the current specifications "Standard Specification for Highway Bridges" of the American Association of State Highway Officials, and to the "Standard Specifications for Welded Highway and Railway Bridges" of the American Welding Society, except as otherwise noted on the drawings or specified.

(1) The contractor shall furnish, without extra cost to the Government, two certified copies of all mill reports covering the chemical and physical properties of the steel used in the work under this specification.

(2) Substitutes of sections, or modifications of details, or both, shall be made only when approved by the Contracting Officer.

(3) The contractor alone shall be responsible for all errors of fabrication and for the correct fitting of the structural members shown on the shop drawings.

b. Structural Steel. - Structural steel shall be welding type structural steel and shall conform to the requirements of Paragraph 30-02.

c. Shear Connectors. - Studs shall have solid or granular flux filled ends and shall conform to ASTM Designation A-108-58T, and AISI 1020 Cold Drawn Steel. Studs shall be fastened to plate by end welding in the shop or the field using an approved stud welding gun. No paint shall be applied to any surface of the shear connectors or to the upper surface of the plate to which it is to be welded.

d. Bridge Bearing Pads. - Bridge bearing pads, similar and approved equal to Fabreeka Products Company bridge masonry plate pads or Johns-Manville #600 Bridge Bearing Pad, thickness as indicated.

e. Miscellaneous. - Miscellaneous items shall conform to applicable requirements of Section 30.

28-03. INSPECTION AND TESTS. - The material to be furnished under this specification shall be subject to inspection and tests in the mill, shop, and field by the Government inspectors. Inspection and tests will be conducted without expense to the contractor, however, inspection in the mill or shop shall not relieve the contractor of his responsibility to furnish satisfactory materials, and the Government reserves the right to reject any material at any time before final acceptance of the structure when, in the opinion of the Contracting Officer, the materials and workmanship do not conform to the specification requirements.

24-04. DESIGN. - a. The design of members and connections for any portions of the structure not indicated on the design drawings shall be completed by the fabricator. Shop drawings shall be submitted in accordance with the SPECIAL CONDITIONS. Such design shall conform to the requirements of the current issue of the Standard Specification for Highway Bridges of the American Association of State Highway Officials. Drawings showing such designs, comparable in extent of information and detail to those issued by the Contracting Officer, shall be submitted for approval before any material is fabricated. Subsequent to approval by the Contracting Officer, no changes or modifications shall be made without his consent.

b. Shop drawings will not be submitted nor fabrication commenced for the Access Bridge until the rock excavation for the spillway channel has been completed and has been inspected and approval given by the Contracting Officer, in writing, prior to preparation of shop drawings and fabrication. In the event there is any variation in the rock surface in the vicinity of the bridge abutments, from that indicated on the drawings, the Contracting Officer will determine if any redesign is necessary. In the event redesign of the bridge is required, such redesign will be performed by the Government, and an equitable adjustment will be made to the contract price for Item No. 76 due to the required changes.

28-05. WORKMANSHIP. - a. Connections. - Connections shall be welded as shown on the drawings, except where bolting is indicated.

b. Holes. - Holes shall not be made or enlarged by burning, nor will the burning of unfair holes in the shop or field be acceptable. Holes in base or bearing plates shall be drilled. Holes shall be provided in members to permit connecting the work of other trades who will furnish the necessary templates or such information as may be required.

c. Nuts. - Nuts shall be of an approved self-locking type, or the bolt threads shall be upset to prevent backing off of the nuts.

28-06. ERECTION. - a. Driftpins. - Driftpins may be used only to bring together the several parts; they shall not be used in such manner as to distort or damage the metal.

b. Gas Cutting Torch. - The use of a gas cutting torch in the field for correcting fabrication errors will not be permitted for major member in the structural framing. Its use will be permitted on minor members when the member is not under stress, and then only after specific approval has been obtained.

c. Preparation of Bearing Area. - Bearings shall be set in exact position and shall have a full and even bearing upon the concrete work of the supporting structure. Bridge seats which are improperly finished, deformed or irregular within the bearing area of the bridge pads shall be corrected before the pads are placed.

28-07. PAINTING. - All structural steel and castings, unless otherwise noted on the drawings or specified, shall be painted as specified in Section, PAINTING, of these specifications. Structural steel and connectors to be encased in concrete shall not be painted.

28-08. PAYMENT. - Payment for furnishing, installing, and erecting the access and service bridge superstructures will be made at the applicable lump sum contract prices for Item 76, "Structural Steel - Access Bridge", and Item 75, "Structural Steel - Service Bridge"; prices shall include the cost of all shapes, bearing plates, shoes, connectors, anchors, bolts, and expansion plates. Pavement drains will be measured and paid for under Item No. 73 "Miscellaneous Metals". Railings will be measured and paid as under Item No. 77, "Aluminum". Structural steel in expansion joints, including sections anchored in part to the intake tower and piers and abutments shall be furnished and paid for under the applicable items for "Structural Steel", for access and service bridges. Bridge lights and light posts will be included under Item 87 "Electrical Work, Exterior."

SECTION 29

MISCELLANEOUS METAL ITEMS
(Items 73, 74, and 77)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
29-01	Scope	29-1
29-02	General	29-1
29-03	Shop Drawings and Samples	29-1
29-04	Metal Fasteners and Anchor Bolts	29-1
29-05	Miscellaneous Structural Steel Items	29-1
29-06	Steel Guards	29-2
29-07	Steel Pipe Railings	29-2
	a. Fabrication	29-2
	b. Anchorage	29-2
	c. Removable Sections	29-2
29-08	Wrought Iron Pipe Railings	29-3
29-09	Chain and Attachments	29-3
29-10	Steel Stairs	29-3
29-11	Steel Ladders	29-3
29-12	Checkered Steel Plates and Frames	29-3
29-13	Metal Gratings and Frames	29-3
29-14	Safety Treads	29-3
29-15	Aluminum	29-3
	a. General	29-3
	b. Materials	29-4
	c. Workmanship	29-4
	d. Installation	29-4

Paragraph No.	Paragraph Title	Page No.
29-16	Painting	29-4
29-17	Payment	29-4
	a. Aluminum	29-4
	b. Miscellaneous Metals	29-4
	c. Structural Steel - Miscellaneous	29-5

SECTION 29

MISCELLANEOUS METAL ITEMS
(Items 73, 74, and 77)

29-01. SCOPE. - This section covers the furnishing and installation of miscellaneous metal items not covered in other sections of the specifications.

29-02. GENERAL. - a. Materials and workmanship, except as otherwise specified under this section, shall conform to the applicable requirements of Sections 30 and 31. Shop drawings shall be submitted for all specified items, for all shop fabricated metal items and as required to complement the contract drawing details. Items furnished, unless otherwise specified or indicated on the drawings shall be standard manufacturer's products fabricated in accordance with the best shop methods. The contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Items indicated to be galvanized shall be hot-dip galvanized after fabrication. All exposed fastenings shall be of the same material, color and finish as the metal to which it is applied, unless otherwise shown or specified. Material shall be free from defects, and of the best commercial quality. Supplementary parts customarily necessary to complete each item though such part is not definitely shown or specified, shall be included.

b. All ferrous metal items exposed to the weather and exterior to structures such as gratings, floor plates, manhole covers, and frames shall be galvanized. Interior metal items, except as specifically specified, need not be galvanized except that all wrought iron pipe railings and wrought iron rungs and all pull bars shall be galvanized.

29-03. SHOP DRAWINGS AND SAMPLES. - a. Shop drawings for all parts of the work hereinafter designated shall be submitted to the Contracting Officer for approval in accordance with paragraph entitled Shop Drawings of Part II, SPECIAL CONDITIONS. Drawings shall indicate thickness of metal, all dimensions, construction details, reinforcement and anchorage.

b. Samples of all metal fasteners and anchors shall be submitted for approval.

29-04. METAL FASTENERS AND ANCHOR BOLTS.- All metal fasteners and anchor bolts except those specified elsewhere to be furnished for and set with parts included in other sections of these specifications, shall be provided hereunder where necessary and required for completion of the work.

29-05. MISCELLANEOUS STRUCTURAL STEEL ITEMS. - All miscellaneous structural steel items such as steel access covers, bars, angles, pull bars, lifting eyes, and plates shall conform either to ASTM Standard 27 or A-36-60T or Federal Specification QQ-S-741a, Type I. Welding quality steel shall be provided where required.

29-06. STEEL GUARDS. - Where indicated, steel guard for door and other openings shall be protected with structural steel members anchored in the concrete with welded steel straps.

29-07. STEEL PIPE RAILINGS. - Pipe rails shall be steel pipe conforming to Federal Specifciation WW-P-406a, except that bend sections shall conform to Federal Specification WW-P-404a. Pipe shall be of size and weight indicated. All pipe railing, except within structures, shall be hot-dip galvanized after fabrication.

a. Fabrication. - Jointing of post rail and corners shall be as follows.

(1) Mitered and welded type joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints and grinding smooth. Railing splices shall be butted and reinforced by a tight-fitting interior sleeve not less than 6 inches long.

(2) Railings may be bent at corners in lieu of mitering and welding or using fittings, provided all such bends are made in suitable jigs and that the cylindrical cross section of the pipe he maintained through the entire bending.

b. Anchorage. - Unless otherwise shown on the drawings, pipe railing shall be anchored as specified below.

(1) Where shown, installation of posts on concrete, shall be provided with pipe sleeve inserts, size as shown and shall be set and anchored in the concrete. Posts shall be inserted in sleeves, leveled, plumbed, and calked solid with molten lead or lead wool. Anchorage joint shall be covered with pipe collar pinned to post. Ends of rails shall be secured by means of standard steel pipe flange anchored to masonry or concrete walls with expansion bolts, toggle bolts, or cinch anchors.

(2) Where indicated, posts shall be set in standard steel pipe floor flange securely anchored to concrete with expansion bolts.

(3) For steel stairs, railing shall be anchored to steel channel stringers as detailed.

c. Removable Sections. - Removable sections shall be furnished as indicated on the drawings.

29-08. WROUGHT IRON PIPE RAILINGS. - Wrought iron pipe railings shall conform to the applicable requirements of Paragraph 29-07 and to the requirements detailed on the plans.

29-09. CHAIN AND ATTACHMENTS. - Chains shall conform to Federal Specification RR-C-271a with Am-1, Type I, Grade C, Class 4. Types of attachments shall be as required for a complete installation, including spring snaps and forged steel eye bolts.

29-10. STEEL STAIRS. - Ships ladder shall be fabricated and erected where shown.

29-11. STEEL LADDERS. - Steel ladders shall be of the bar and rung type, constructed of structural steel in accordance with the details and the following minimum requirements. Stringers shall be a minimum 3/8-inch by 2-1/2-inch mild steel bars fitted with anchor lugs for securing to concrete as indicated. Rungs shall be 3/4-inch minimum round, solid section steel rods, fitted into punched holes in stringers, welded and ground smooth. Ladders shall be secured at each end and at intermediate points as indicated.

29-12. CHECKERED STEEL PLATES AND FRAMES. - Frames shall be all welded construction of standard steel shapes with anchors for concrete. Frame construction shall be such that tops of frames and cover plates will finish flush with floor. Covers shall be standard checkered steel plates conforming to Federal Specification QQ-F-461, Type II. Weights and thicknesses of metal shall be as detailed and steel other than checkered steel plates shall conform to Federal Specification QQ-S-741a or ASTM A7-58T or A36-60T. All sharp edges and burrs shall be removed from cover units and exposed edges.

29-13. METAL GRATINGS AND FRAMES. - Metal gratings shall conform to the requirements of Federal Specification RR-G-661, Type I. Edges of all gratings shall be banded, and all gratings shall be hot galvanized to conform to Federal Specification QQ-S-775a, Class C. Frames shall be of standard steel angles and shall be all-welded construction, and galvanized to match grating. Frames shall be provided with welded-on anchors.

29-14. SAFETY TREADS. - Where indicated, concrete stair treads and landings shall have metal safety treads size as shown. Treads shall be installed and anchored in accordance with the manufacturer's instructions.

29-15. ALUMINUM. - a. General. - All aluminum work, except aluminum letters, and all necessary bolts and fastenings, and other items as called for on the drawings shall be furnished and installed under Item "Aluminum".

b. Materials. - (1) Bridge railings shall be similar and approved equal to types indicated on the drawings.

(2) Pipe for pipe railings shall conform to ASTM Specification B241-59T, alloy 6061, Temper T6. Hatch covers, angle frames, and other items of structural aluminum shall conform to Federal Specifications QQ-A-270a, Alloy 6061, Temper T6, or QQ-A-327b, Temper T6, as applicable. Rivet and bolts shall be structural aluminum alloy conforming to 6061-T6.

c. Workmanship. - Materials and workmanship shall conform to the applicable requirements of "Specifications for Structures of Aluminum Alloy 6061-T6", Second Progress Report of the Committee of the Structural Division on Design in Lightweight Structural Alloys, of the American Society of Civil Engineers.

d. Installation. - The railings and other items shall be installed in a first class, workmanlike manner. Anchor bolts, grating, fasteners, washers, and all parts or devices necessary for proper installation, whether or not fully detailed on the drawings, shall be furnished and placed by the contractor. Where aluminum is secured to concrete work, corrosion resisting steel anchors shall be used. All nuts, screws, and other fastening devices shall be tight. No materials shall be used which will react on aluminum. Hatch covers shall be fabricated and installed complete with hinges and handles. No welding will be permitted except as indicated. Painting will not be required.

29-16. PAINTING. - Surfaces of miscellaneous metal items embedded in concrete shall not be painted. Surfaces of all other items specified herein shall be painted in accordance with section entitled, PAINTING.

29-17. PAYMENT. - a. Aluminum. - Unless elsewhere specified to be included under other payment items, measurement and payment for all aluminum as called for on the drawings will be made under Item No. 77, "Aluminum". The contract unit price per pound of aluminum shall include the cost of furnishing (including non-aluminum items as required) and installing all materials in accordance with the drawings and the specifications.

b. Miscellaneous Metals. - Unless elsewhere specified to be included under other payment items, all miscellaneous metals as called for on the drawings will be made at the contract price per pound for Item No. 73, "Miscellaneous Metals". Items to be paid for under miscellaneous metals include steel and wrought iron pipe railings and rungs, pull bars, stair treads, chains, inserts, and such items so identified for payment on the plans. The contract price per pound shall include the cost of furnishing and installing all accessories and attachments in accordance with the drawings and specifications.

c. Structural Steel - Miscellaneous. - Unless elsewhere specified to be included under other payment items, all miscellaneous structural steel items as called for on the drawings will be made at the contract price per pound for Item No. 74, "Structural Steel - Miscellaneous". Miscellaneous structural steel items to be paid for include steel stairs and ladders, crane rail supports, and frames and anchors at openings (except doors), and hatchway covers and gratings. The contract price per pound shall include furnishing and installing of all required attachments.

SECTION 30

METALS, MISCELLANEOUS MATERIALS AND STANDARD ARTICLES
(Index)

Paragraph No.	Paragraph Title	Page No.
30-01	Standard Specifications	30-1
30-02	Structural Steel	30-1
30-03	Steel, Concrete Reinforcement	30-2
30-04	Steel Forgings	30-2
30-05	Steel Castings	30-2
30-06	Steel Bolts and Nuts	30-2
30-07	Aluminum	30-2
30-08	Corrosion-Resisting Steel Pins and Bolts	30-2
30-09	Hot-Roller Steel, For Shafting, Sleeves, and Rollers	30-2
30-10	Bronze	30-2
	a. Castings	30-2
	b. Manganese Bronze Castings	30-2
	c. Rolled Manganese Bronze and Manganese Bronze Forgings	30-2
30-11	Brass	30-2
	a. Sheets, Plates and Bars	30-2
	b. Castings	30-2
	c. Naval Brass	30-3
30-12	Copper	30-3
30-13	Sheet Lead	30-3
30-14	Zinc	30-3
30-15	Babbitt Metal	30-3
30-16	Safety Treads	30-3

Paragraph No.	Paragraph Title	Page No.
30-17	Steel Floor Grating	30-3
30-18	Steel Floor Plates	30-3
30-19	Non-Metallic Waterstops	30-3
30-20	Rubber Gate Seals	30-3
30-21	Joint Sealing Compound	30-4
30-22	Iron Castings, Gray	30-4
30-23	Malleable Iron Castings	30-4
30-24	Malleable Iron Fittings	30-4
30-25	Sheet Iron	30-4
30-26	Solder	30-4
30-27	Brass Pipe and Fittings	30-5
30-28	Copper Tubing	30-5
30-29	Valves	30-5
30-30	Chain and Attachments	30-5
30-31	Steel Pipe	30-5
30-32	Wrought Iron Pipe	30-5
30-33	Wrought Iron Shapes	30-5
30-34	Payment	30-5

SECTION 30

METALS, MISCELLANEOUS MATERIALS AND STANDARD ARTICLES

30-01. STANDARD SPECIFICATIONS. - a. Standard specifications of the following listed authorities whenever cited herein are referred to by use of the abbreviations shown below:

NAME	ABBREVIATION
Federal Specifications	Fed. Spec.
Military Specifications	MIL or JAN
U. S. Army Engineer Waterways Experiment Station P. O. Box 631, Vicksburg, Mississippi	CRD-C
American Society for Testing Materials 1916 Race Street Philadelphia 3, Pennsylvania	ASTM

b. Reference copies of specifications published by agencies of the Department of Defense are on file in the Office of the Contracting Officer, and may be viewed by interested parties upon request. Copies of Fed. Specs. may be obtained at nominal cost by writing to the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Copies of the specifications of other listed authorities may be purchased by writing directly to such organizations at the addresses shown above.

c. In the paragraphs below, each metal, miscellaneous material or standard article is followed by the number and title of the specifications, to which the items is required to conform.

30-02. STRUCTURAL STEEL. - a. Federal Specification QQ-S-741a, "Steel Plates, Shapes and Bars, Carbon, Structural", Type I or II (as specified or as shown on the drawings), Class 1. Wherever Type I steel is required, Type II steel will also be acceptable.

b. Requirements in Federal Specification QQ-S-741a, paragraph 3.6 for identification marking are waived for Type I structural steel. Identification marking of type will be required whenever Type II steel is required except when certified mill reports are furnished, in which case requirements for such marking will be waived.

c. The contractor may at his option furnish steel conforming to ASTM A7-58T, Specifications for "Steel for Bridges and Buildings" when steel conforming to QQ-S-741a, Type I, is indicated or specified; or also he may at his option furnish steel conforming to ASTM A373-58T, Specifications for "Structural Steel for Welding" when steel conforming to QQ-S-741a, Type II, is specified or indicated.

d. The contractor may at his option furnish steel conforming to ASTM A36-60T in lieu of steel conforming to Federal Specification QQ-S-741a, Types I and II. Identification marking of type will be required whenever steel conforming to ASTM A36-60T is provided except when certified mill reports are furnished, in which case requirements for such marking will be waived.

30-03. STEEL, CONCRETE REINFORCEMENT. - Specified and included under Section "Concrete".

30-04. STEEL FORGINGS. - ASTM A235-55, Specifications for "Carbon Steel Forgings for General Industrial Use", Class as required.

30-05. STEEL CASTINGS. - Federal Specification QQ-S-681b, "Steel; Castings", Class 2.

30-06. STEEL BOLTS AND NUTS. - Bolts - Fed. Spec. FF-B-575b; Nuts - Fed. Spec FF-N-836. Unless otherwise specified, steel for bolts shall be Grade 1 and for nuts shall be Grade A.

30-07. ALUMINUM. - See Section 29.

30-08. CORROSION-RESISTING STEEL PINS AND BOLTS. - Corrosion-resisting steel bolts, studs, nuts, washers, bars and shapes shall conform to Federal Specification QQ-S-763b, "Steel Bars, Shapes, and Forgings, Corrosion-Resisting Steel", Condition A, Class 304, and to the applicable requirements of Paragraph, "STEEL BOLTS" above.

30-09. HOT-ROLLER STEEL, FOR SHAFTING, SLEEVES, AND ROLLERS. - ASTM Designation A 107-52aT for "Hot-Rolled Carbon-Steel Bars".

30-10. BRONZE. - a. Castings. - Federal Specification QQ-L-225, "Leaded Tin Bronze Castings and High Leaded Tin Bronze Castings", Composition 6.

b. Manganese Bronze Castings. - Federal Specification QQ-B-726c, "Bronze, Manganese and Aluminum-Manganese, Castings".

c. Rolled Manganese Bronze and Manganese Bronze Forgings. - Federal Specification QQ-M-80, "Manganese Bronze Bars, Plates, Rods, Sheets, Strips, Flat Wire, Forgings, and Structural and Special Shaped Sections", Class A, temper half hard.

30-11. BRASS. - a. Sheets, Plates and Bars. - Federal Specification QQ-B-613a, "Brass, (Copper-Zinc Alloy), Leaded and Non-leaded; Plate, Rolled Bar, Sheet and Strip", Composition and Temper as required.

b. Castings. - Federal Specification QQ-B-621b, "Brass; Castings, Leaded Yellow", Composition B.

c. Naval Brass. - Federal Specification QQ-N-35, "Naval Brass; Rods, Bars, Wire, Shapes and Forgings and Flat Products with Finished Edges". All brass shall be of this material except as otherwise specified.

30-12. COPPER. - Federal Specification QQ-C-576a, "Copper Plates, Rolled Bars, Sheets, and Strips", Temper as required.

30-13. SHEET LEAD. - Federal Specification QQ-L-201d, "Lead; Sheet", Grade B.

30-14. ZINC. - Federal Specification QQ-Z-351a, "Zinc, Slab (Spelter)", Type III.

30-15. BABBITT METAL. - Federal Specification QQ-T-390, "Tin Alloy Ingots and Castings and Lead Alloy Ingots and Castings (Antifriction Metal) for Bearing Applications", Grade 3.

30-16. SAFETY TREADS. - Federal Specification RR-T-661, "Treads; Safety, Metallic", Type B, Class 6, size as indicated.

30-17. STEEL FLOOR GRATING. - Federal Specification RR-G-661a, Type I, galvanized edges shall be bonded. Fasteners shall be of an approved type.

30-18. STEEL FLOOR PLATES. - Checkered steel plates shall be standard plates conforming to Federal Specification QQ-F-461, Type II. Weights and thicknesses of metal shall be as detailed. Plates other than checkered steel plates shall conform to Federal Specification QQ-S-741a or ASTM A 7 or A 36.

30-19. NON-METALLIC WATERSTOPS. - Waterstops may be composed of natural rubber, a suitable synthetic rubber, a blend of natural and synthetic rubber, or of polyvinylchloride. Rubber waterstops shall comply with the requirements of CRD-C-513-60, "Corps of Engineers Specifications for Rubber Waterstops". Polyvinylchloride waterstops shall conform to the requirements of CRD-C-572-60A, "Corps of Engineers Specifications for Polyvinylchloride Waterstops".

30-20. RUBBER GATE SEALS. - The material for gate seals shall be compounded of natural rubber containing only carbon black, zinc oxide, accelerators, vulcanizing agents, antioxidants, copper inhibitors and plasticizers. Physical characteristics shall meet the following requirements:

Physical Test	Test Value	Test Method Specification
Tensile Strength	2500 p.s.i. (min)	Fed. Std. 601, Method No. 4111
Elongation at break	450% (min)	Fed. Std. 601, Method No. 4121
300% Modulus	900 p.s.i. (min)	Fed. Std. 601, Method No. 4131
Durometer Hardness Shore Type A	60 to 70	Fed. Std. 601, Method No. 3021
Water Absorption	5% by weight (max)	Fed. Std. 601, Method No. 6631
Compression Set	30% (max)	Fed. Std. 601, Method No. 3311
Tensile Strength after aging	80% (min) of tensile strength	Fed. Std. 601, Method No. 7111 Oxygen bomb method
Adhesion on 18 ounce cotton farbic	18 lbs. per inch (min)	Fed. Std. 601, Method No. 8011 or 8021

30-21. JOINT SEALING COMPOUND. - Sealing compound shall conform to Federal Specification TT-S-00227, Class B, self-curing color as selected by the Contracting Officer to match contiguous concrete. Rope yarn used for backstops shall be the raveled strands of rope fiber free from oil or other staining element.

a. The entire quantity of sealing compound proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at the source of supply, sufficiently in advance of need to allow 30 days for testing. Sampling and testing will be done by the Government in accordance with referenced specification. The contractor shall provide all required samples. The cost of the first test will be borne by the Government. If the sample fails to meet the specification requirements, the material represented by the sample shall be replaced, and the cost of retesting will be deducted from the payments due the contractor at the rate of $100 per sample retested.

30-22. IRON CASTINGS, GRAY. - Federal Specification QQ-I-652a, for "Iron Castings, Gray", class as indicated or specified. Tensile tests and chemical analysis will not be required.

30-23. MALLEABLE IRON CASTINGS. - Federal Specification QQ-I-666c, "Iron Castings, Malleable", Class A.

30-24. MALLEABLE IRON FITTINGS. - Federal Specification WW-P-521b, for "Pipe Fittings; Malleable-Iron (Screwed), 150-pound".

30-25. SHEET IRON. - Federal Specification QQ-S-775a, for "Steel Sheets, Zinc-Coated" and QQ-S-636, for "Steel; Carbon (low carbon) sheets and strips", as applicable.

30-26. SOLDER. - Federal Specification QQ-S-571c, "Composition SN50".

30-27. BRASS PIPE AND FITTINGS. - Federal Specification WW-P-351, for "Pipe; Brass, Seamless, Iron-Pipe Size, Standard and Extra Strong", Grade A, and WW-P-460, for "Pipe-Fittings; Bronze (screwed), 125-and 250-pound", class as required.

30-28. COPPER TUBING. - Federal Specification WW-T-799a, for "Tubing; Copper, Seamless (for use with Solder Joint or Flared-Tube Fittings)".

30-29. VALVES. - Federal Specification WW-V-51a, for "Valves, Bronze, Angle, Check, and Globe 125- and 150-pound, Screwed and Flanged (for Land Use)". WW-V-54, for "Valves, Bronze, Gate; 125- and 150-pound, Screwed and Flanged (for Land Use)". WW-V-58, for "Valves, Cast-Iron, Gate; 125- and 250-pound, Screwed and Flanged (for Land Use)", as applicable.

30-30. CHAIN AND ATTACHMENTS. - Federal Specification RR-C-271, "Chain and Attachment; Standard, Miscellaneous". Chain shall be Type I, Grade C, Class 4, unless otherwise indicated on the drawings. Types and classes of attachments and accessories shall be as called for on the drawings.

30-31. STEEL PIPE. - (including black steel pipe). - Federal Specification WW-P-406, "Pipe; Steel and Ferrous Alloy (for) Ordinary Uses (Iron-Pipe Size), class A or B and galvanized if so indicated on the drawings.

30-32. WROUGHT IRON PIPE. - Federal Specification WW-P-441b, class A or B and galvanized if so indicated on the drawings.

30-33. WROUGHT IRON SHAPES. - Federal Specification QQ-I-686b, Grade B, galvanized, if indicated.

30-34. PAYMENT. - No separate payment will be made for the work, materials, or supplies covered in this section of the specifications and all costs in connection therewith shall be included in the applicable contract prices for the items or structure involved.

SECTION 31

METALWORK FABRICATION, MACHINE WORK AND MISCELLANEOUS PROVISIONS

(INDEX)

Paragraph No.	Paragraph Title	Page No.
31-01	Scope	31-1
31-02	Workmanship	31-1
	a. General	31-1
	b. Dimensional Tolerances for Structural Work	31-1
31-03	Welding	31-1
	a. General	31-1
	b. Inspection	31-2
	c. Welding Equipment	31-2
	d. Filler Metal	31-2
	e. Special Workmanship Requirements	31-3
31-04	Flame Cutting	31-4
31-05	Riveting	31-5
	a. Rivet Holes	31-5
	b. Rivets and Driving	31-5
31-06	Bolted Connections	31-6
	a. Bolt Holes	31-6
	b. Bolts and Nuts	31-6
	c. Washers	31-6
	d. Special Bolted Connections	31-6
	e. High-Strength Bolting	31-7
31-07	Machine Work	31-7
	a. General	31-7
	b. Finished Surfaces	31-7
	c. Unfinished Surfaces	31-8
	d. Keys and Keyways	31-8
	e. Pine Holes	31-8

Paragraph No.	Paragraph Title	Page No.
	f. Gears	31-8
	g. Shafting	31-8
	h. Bearings	31-9
	i. Protection of Machined Surfaces	31-9
	j. Lubrication	31-9
31-08	Steel W 11 Armoring and Protection Angles	31-9
31-09	Metallic Coatings	31-10
	a. Zinc Coatings	31-10
	b. Castings	31-10
31-11	Patterns	31-10
31-12	Lists of Materials	31-11
31-13	Shop Assembly	31-11
31-14	Field Assembly	31-11
	a. General	31-11
	b. Alignment and Setting	31-12
	c. Blocking and Wedges	31-12
	d. Foundations and Groutings	31-12
31-15	Tests and Trials	31-12
	a. General	31-12
	b. Analysis of Material	31-12
	c. X-Ray and Gamma-Ray Tests	31-12
31-16	Measurement and Payment	31-13
	a. Measurement	31-13
	b. Payments	31-14
	c. Partial Payment	31-14

SECTION 31

METALWORK FABRICATION, MACHINE WORK AND MISCELLANEOUS PROVISIONS

31-01. SCOPE. - This section specifies the workmanship standards applicable to the various phases of metalwork fabrication, the methods and precautions for erection of metal structures and machines, the general requirements for tests and trials on such structures and machines to insure conformance with the specifications, and miscellaneous requirements incidental to the work.

31-02. WORKMANSHIP. - a. General. - Material shall be thoroughly straightened by methods that will not result in injury, except that sharp kinks or bends in members to be straightened will be cause for rejection. Finished members shall be free from kinks, bends, or winds. Shearing shall be accurately done, and all portions of the work neatly finished. Corners shall be square and true unless otherwise shown on the drawings. Re-entrant cuts shall be made in a workmanlike manner and, where they cannot be made by shearing, a rectangular punch may be used. Re-entrant cuts shall be filleted unless otherwise approved by the Contracting Officer. Bends, except for minor details, shall be made by approved dies or bending rolls. Where heating is required, precautions shall be taken to avoid overheating the metal and it shall be allowed to cool in such a manner as not to destroy the original properties of the metal. Steel with welds will not be accepted, except where welding is definitely specified, called for on the drawings, or otherwise approved. All bolts, nuts, and screws shall be tight. The ends of pipe, except for handrailing, shall be reamed.

b. Dimensional Tolerances for Structural Work. - (1) Dimensions shall be measured by means of an approved calibrated steel tape of the same temperature as the structure at the time of measurement. Unfairness of platework shall be held to a practicable minimum.

(2) An allowable variation of 1/32-inch is permissible in the over-all length of members with both ends milled. Members without milled ends, which are to be assembled to other steel parts of the structure, shall not deviate from the dimensions shown on the drawings by more than 1/16-inch for members 30 feet or less in length, and by not more than 1/8-inch for members over 30 feet in length.

31-03. WELDING. - a. General. - Unless otherwise authorized or specified, welding shall be by electric arc-welding process, using a method which excludes the atmosphere from the molten metal. Welding, unless specified otherwise, shall conform to the applicable provisions of the current AWS "Specification for Welded Highway and Railway Bridges". Welding operators, including tack welders and machine welders, and machines shall be qualified, and as necessary requalified, for the particular type of work to be done, as required by the American Welding Society "Tentative Standard Qualification Procedure", the U. S. Navy Department "General Specifications for Inspection of Material", Appendix VII, "Welding", the U. S. Coast Guard "Marine Engineering Regulations and Material Specifications", or by Section IX of the "ASME Boiler and Pressure Vessel Code". The contractor shall certify by name, to the Contracting Officer, the welding operators so qualified, and the code under which qualified. The contractor shall require any welder to repeat the qualifying tests when, in the opinion of the Contracting Officer, the work of the welder indicates a reasonable doubt as to his efficiency. In such cases, the welder shall be recertified, as above, if he successfully passes the retest; otherwise he shall be disqualified until he has successfully passed a retest. Welding, except light caulk welding, will not be permitted in combination with riveting in the same joint. All expenses in connection with qualification and requalification shall be borne by the contractor.

b. Inspection. - Welding shall be subject to inspection by Government inspectors in conformance with the applicable inspection requirements of paragraph 31-03a. The Contracting Officer may also require coupons to be cut from any location in any joint for testing. All sections of welds found defective shall be chipped or cut out to base metal and properly rewelded before proceeding with the work. Should any two coupons cut from the work of any welder show strengths, under tests, less than that of the base metal, it will be considered evidence of negligence or incompetence and such welder shall be permanently removed from the work. When coupons are removed from any part of a structure, the members cut shall be repaired, at the expense of the contractor, in a neat and workmanlike manner with joints of proper type to develop the full strength of the members and joints cut, with peening as necessary or directed to relieve residual stress.

c. Welding Equipment. - Manual and automatic arc-welding machines and equipment may be of either the alternating current or direct current type and shall conform to the requirements for arc-welding equipment as set forth in the AWS "Specification for Welded Highway and Railway Bridges".

d. Filler Metal. - (1) Unless otherwise specified or authorized, all deposited weld metal shall have elastic limits and ultimate tensile strengths not less than those specified for the respective base metals welded; shall have an elongation in 2 inches, using annealed samples, of at least 95 percent of the value specified for the base metal or at least 75 percent using unannealed samples; chemical composition similar to that of the base metal and, when subjected to approved tests, shall have corrosion resistance at least equivalent to that of the base metals.

These properties shall be determined by testing in accordance with the applicable provisions of the AWS specifications, or as otherwise approved by the Contracting Officer.

(2) Welding electrodes and rods shall be of a type and grade approved by the Contracting Officer; of such chemical composition and physical properties as will produce the characteristics specified above; and so adapted to the base metal and thickness of parts to be welded as will insure effective penetration and an intimate uniform fusion of the filler and base metals, in all welding positions and under all conditions to be encountered, without undercutting or overlapping. The electrodes shall conform to applicable provisions of the ASTM specifications.

e. Special Workmanship Requirements. - (1) Welding Procedure. - The contractor shall prepare a schedule of welding procedure for each structure to be welded, including any stress-relief annealing, and shall submit the schedules for approval in accordance with the requirements of SC-4, "Shop Drawings". The procedures shall be in accordance with the best modern welding practice, and shall be such as to minimize residual stresses and distortion of the finished members of the structure. Should it be found that changes in any previously approved welding procedure are desirable, the Contracting Officer will direct or authorize the contractor to make such changes. Approval of any procedure, however, will not relieve the contractor of the sole responsibility for producing a finished structure meeting all requirements of these specifications.

(2) Stress-Relief Annealing. - Where stress-relief annealing is specified or required on the drawings, it shall be in accordance with the requirements of paragraph 512 of the AWS "Specification for Welded Highway and Railway Bridges", unless otherwise authorized or directed by the Contracting Officer.

(3) Welds. - Assembly of all welded joints before welding shall be such as to secure specified root openings. The maximum length of bead laid in any one continuous or skip pass shall be that which can be laid with one electrode. Unless otherwise specifically authorized, all welds shall be of the type, size, and dimensions as shown on the drawings. Welds 3/8-inch and larger shall be made in not less than 2 passes; and, unless otherwise specified or authorized, shall be made with one pass for each 3/16-inch of the maximum thickness of the weld metal, exclusive of back bead. Welds for watertight work shall be continuous and made in not less than 2 passes for butt joints and for at least one fillet weld of "Tee" joints and lap joints. In all welding, the application of the first pass shall be given special attention to insure satisfactory penetration and fusion of the filler and base metals. Preheating, root-chipping, and peening shall be utilized where directed to assure the soundness

of highly important or heavily stressed connections and to relieve heavy residual stresses. Wherever practicable, peening shall be done by pneumatic tools. Unless otherwise directed, the first and last beads of welded connection shall not be peened. The "housing" of welded connections by "returning" or "boxing" shall be employed as required, in accordance with approved welding practice.

(4) Assembling Devices and Temporary Connections. - Preparatory to welding, the assembled elements of members shall be held rigidly in position by the use of approved devices adapted to the purpose, and capable of exerting pressures requisite to remove local distortions and press the parts into intimate contact except where root openings are required. Bolts may be used for temporary connections provided that the bolt holes are subsequently filled in an approved manner, with sound weld metal and ground flush with adjacent base metal, unless otherwise authorized. Welding for temporary connections and bracing will be permitted provided that, where such welded connections do not form a part of a later permanent connection, such weld metal shall be removed, where so directed, approximately flush with adjacent base metal and in no case shall depressions be left in the finished work.

(5) Preheating. - Preheating shall be performed where specified or otherwise required. The weldments to be preheated shall be slowly and uniformly heated by approved means to the prescribed temperature, held at that temperature until the welding is completed and then permitted to cool slowly in still air.

(6) Welding of Steel Castings. - Castings shall be chipped, machined or ground to sound base metal at any surfaces which will be incorporated into welded connections. Major connections, designed for transfer of stresses, shall not be welded if the temperature of the casting is lower than 100 degrees F. Castings containing over 0.35 percent and up to 0.45 percent carbon or over 0.75 percent manganese, except Classes 1 and 2 (Fed. Spec. QQ-S-681b) shall be preheated to a temperature not to exceed 450 degrees F. and welding shall be accomplished while the castings are maintained at a temperature above 350 degrees F. Welding will not be permitted on castings containing carbon in excess of 0.45 percent, except on written authorization of the Contracting Officer.

31-04. FLAME CUTTING. - Low-carbon structural steel may be cut by machine-guided or hand-guided torches instead of by shears or saws. Flame cutting of material other than low-carbon structural steel shall be subject to approval and where proposed shall be definitely indicated on shop drawings submitted to the Contracting Officer. Where a torch is mechanically guided, no chipping or grinding will be required except as necessary to remove slag and sharp edges. Where a torch is hand guided, all cuts shall be chipped, ground, or machined to sound metal except where material is not to be welded, in which case burrs and rough edges only shall be removed. Where the torch is mechanically guided, flame gouging will be permitted in preparation for welding.

31-05. RIVETING. a. Rivet Holes. (1) General. Rivet holes, except those in lateral, longitudinal, and sway-bracing which may be punched full size, shall be subpunched or subdrilled at least 1/8-inch smaller than the nominal size of the rivet and then reamed to a diameter not more than 1/16-inch greater than the nominal diameter of the rivet, unless otherwise specified or authorized. The thickness of the material in punched work shall not be greater than the nominal diameter of the rivet, plus 1/8-inch. Material of greater thickness shall be drilled. For shop riveting, if the parts to be riveted are welded, bolted, or clamped together before drilling of rivet holes, the holes may be drilled full size. The accuracy of workmanship of holes punched or drilled full size shall be such that for any group of contiguous holes in the same plane when assembled, 75 percent shall admit a rod equal to the nominal diameter of the cold rivet at right angles to the plane of the connection. When holes for field connections are required to be subpunched, and the work is assembled and match-marked in the shop, the holes shall be reamed in the shop. Subpunched work not assembled in the shop shall be reamed in the field after the work has been assembled and bolted together. Where reaming is not required, the diameter of the punch shall be not more than 1/16-inch greater than the diameter of the rivet; nor shall the diameter of the die opening be more than 1/16-inch greater than the diameter of the punch. Punching shall be accurately done. Drifting to enlarge unfair holes will not be allowed and poor matching of holes will be cause for rejection. For slight mismatching, reaming to a larger diameter for the next standard size of rivet may be allowed. Holes shall be accurately spaced, cylindrical, and perpendicular to the member. Countersinking shall be true and square with the hole.

(2) Reaming and Drilling. Reaming and final drilling shall be done with the component parts of the member assembled and firmly clamped together. Drilling shall be done with twist drills. Reaming shall be done with short taper reamers having not less than four (4) flutes. Reamed holes shall be smooth, showing that the reamers have touched the entire circumference. Outside burrs on reamed holes shall be removed to the extent of making a 1/16-inch chamfer. The accuracy of workmanship of holes required to be reamed or drilled after assembly shall be such that at least 75 percent of any group of contiguous holes in the same plane shall show no offset greater than 1/32-inch between adjacent thicknesses of metal.

b. Rivets and Driving. Riveted members shall have all parts well pinned and firmly drawn together with bolts before riveting is commenced. Unless otherwise specified or authorized by the Contracting Officer, rivets shall be of the same type of material as the members they are used to connect. The size of the rivets specified or required indicates the nominal size of the cold rivets before heating. Rivets shall be heated uniformly to a light cherry red color in a gas, oil, or electric furnace so constructed that it can be adjusted to the proper temperature, except that a coal or coke furnace of approved type may be used for heating field rivets. When heated and ready for driving rivets shall be practically free from slag, scale, and adhesive materials. Rivets shall be hot driven with pressure tools. When driven, rivets shall completely fill the holes. Rivet heads shall be neatly formed with dies of approved shape, and shall be full size, concentric with the rivet hole, and in full contact with the member. Loose, burned, badly formed, or otherwise defective rivets shall be removed and replaced, care being exercised to avoid injury to adjacent metal. Recupping or caulking will not be permitted. Unless otherwise specified or authorized, all countersunk rivet heads shall be chipped or ground flush with the surface of the plate. Field rivets shall not be painted until they have been inspected and accepted.

31-06. BOLTED CONNECTIONS. - a. Bolt Holes. - Holes for unfinished bolts shall be not more than 1/16-inch larger than the nominal diameter of the bolts. Unless otherwise specified or shown on the drawings, holes for turned bolts shall be not more than 0.020 inches larger than the nominal diameter of the bolt. Where the thickness of the material is greater than the nominal diameter of the bolt, holes for unfinished bolts shall be sub-punched and reamed or sub-drilled and reamed or drilled from the solid. Holes for turned bolts shall be truly cylindrical throughout and drilling or reaming shall be done after the parts to be connected are assembled. Poor matching of holes shall be cause for rejection.

b. Bolts and Nuts. - Bolts and nuts shall conform to the applicable provisions of Federal Specifications FF-B-575b and FF-N-836a. Turned bolts shall have Type 3 heads and Group B, Type 3, Style 3-5 and nuts. The body diameter shall have a tolerance of plus 0.000 inches and minus 0.006 inches on the nominal diameter. The finished shank shall be long enough to provide full bearing, and washers shall be used under the nuts to provide full grip when the nuts are tightened.

c. Washers. - Plain washers shall conform to the requirements of ASA B27.2-1958 for "Plain Washers", heavy series and lock washers shall conform to the requirements of ASA B27.1-1958 for "Lock Washers", heavy series. Washers shall be provided for applications specified elsewhere and where indicated on the drawings.

d. Special Bolted Connections. - Where turned bolts with closer fits than specified above are required, the bolts shall have a nominal body diameter at least 1/16-inch larger than the nominal diameter of the threaded portion and the body length shall be 1/16- to 1/8-inch greater than the combined thickness of the connected members unless otherwise indicated on the drawings. Threads shall be Class 3 fit. Holes shall be as specified or indicated on the drawings. Plain washers shall be provided.

e. High-Strength Bolting. - High-strength bolting shall conform to the AISC Specification for Structural Joints using ASTM A 325 Bolts.

31-07. MACHINE WORK. - a. General. - Unless otherwise shown on the shop drawings, all tolerances, allowances, and gages for metal fits shall conform to ASA Standard B4.1-1955, "Preferred Limits and Fits for Cylindrical Parts", for the class of fit as shown or otherwise required. In general, tolerances for surfaces designated by non-decimal dimensions shall be within 1/64-inch. Sufficient machining stock shall be allowed on placing pads to insure true surfaces of solid material. Finished contact or bearing surfaces shall be true and exact to secure full contact. Journal surfaces shall be polished and all surfaces shall be finished with sufficient smoothness and accuracy to insure proper operation when assembled. Parts entering any machine shall be carefully and accurately machined and all like parts shall be interchangeable. All drilled holes for bolts shall be accurately located.

b. Finished Surfaces. - Where the type of surface is indicated on the drawings or specified herein, the finish shall be the corresponding type, as defined below. Where the type of finish is not indicated or specified, the finish shall be that type, as defined below, which is most suitable for the part to which it applies and shall be consistent with the class fit required. Surfaces to be machine finished shall be indicated on the shop drawings by symbols which will show the type of finish to be provided.

(1) For a "rough" finish, pronounced tool marks will be allowed on the surface and slight depressions not affecting the strength or utility of the part will not be cause for rejection. The surface may be produced by rough planing, turning, grinding, sawing, machine-guided flame cutting, or similar operations. In general, a "rough" finish will be required on surfaces which are to be machined to dimension where liberal tolerances will be permitted.

(2) For an "average" finish, a surface true to dimensions will be required; such as may be produced by medium smooth planing, turning, sawing, grinding, or similar operations. Only minor tool marks will be permitted. In general, an "average" finish will be required for stationary mating surfaces where reasonably accurate positioning of the members or a moderately tight joint is desired.

(3) For a "smooth" finish, a surface practically free of tool marks will be required, such as may be produced by smooth planing, turning, milling, grinding, drilling, reaming, or similar methods of machining. Pronounced tool marks or other defects on such surfaces will be cause for rejection. In general, a "smooth" finish will be required on surfaces in sliding or rotating contact when motion is slow and loads are light.

(4) For a "fine" finish, the surface shall be machined to close dimensional tolerances by fine turning, boring, milling, reaming, grinding, medium buffing, burnishing, or similar methods. In general, a "fine" finish will be required on surfaces in sliding or rotating contact when loads and speeds are moderate.

(5) For a "polish" finish, the member shall present a very smooth surface such as may be produced by very fine surface or cylindrical grinding, smooth buffing, coarse honing, coarse lapping, hand finishing with fine emery cloth or other comparable methods. In general, a "polish" finish will be required on surfaces in sliding or rotating contact where loads are heavy or motion is rapid.

c. Unfinished Surfaces. - So far as practicable, all work shall be laid out to secure proper matching of adjoining unfinished surfaces. Where there is a large discrepancy between adjoining unfinished surfaces, they shall be chipped and ground smooth, or machined, to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown on the drawings and shall be chipped or ground free of all projections and rough spots. Depressions or holes not affecting the strength or usefulness of the parts may be filled in a manner approved by the Contracting Officer.

d. Keys and Keyways. - Keys and keyways shall conform to the requirements of ASA Standard B 17.1-1943 for "Shafting and Stock Keys", unless otherwise specified or required.

e. Pin Holes. - Pin holes shall be bored true to gages, smooth and straight, and at right angles to the axis of the member. The boring shall be done after the member is securely fastened in position.

f. Gears. - Unless otherwise specified or shown on the drawings, all gears shall have standard involute teeth, machine cut from the solid rim. Standard cycloidal teeth may be substituted in lieu of involute teeth upon the approval of the Contracting Officer.

g. Shafting. - Unless otherwise specified or authorized, all shafting shall be turned or ground steel shafting conforming to the requirements of ASTM A107-59T. Fillets shall be provided where changes in section occur. Cold-finished shafting to the requirements of ASTM A108-58T, may be used, where keyseating is the only machine work required.

h. Bearings. - Unless otherwise specified or shown on the drawings, bearings may be lined with babbitt or bronze. Where the bearing pressure is in excess of 200 pounds per square inch, they shall be lined with bronze. Unless otherwise required or authorized, pressures on lined bearings shall not exceed 1000 pounds per square inch of projected area. Anti-friction bearings of approved types and of sizes not less than those recommended by the bearing manufacturer for the duty may be permitted at the discretion of the Contracting Officer. All bearings shall be properly aligned and provided with a suitable means for lubrication. Anti-friction bearings shall be so installed as to provide for retention of the lubricant and to exclude dirt and grit.

i. Protection of Machined Surfaces. - (1) Machine-finished surfaces shall be thoroughly cleaned of foreign matter. Finished surfaces of large parts and other surfaces shall be protected with wooden pads or other suitable means. Unassembled pins and bolts shall be oiled and wrapped with moisture resistant paper or protected by other approved means.

(2) Finished surfaces of ferrous metals to be in bolted contact shall be washed with a rust inhibitor and given one thin coat of white or blue lead and tung oil.

(3) Finished surfaces of ferrous metals which will be exposed after installation shall be painted as specified in Section, PAINTING.

j. Lubrication. - The arrangement and details for lubrication are shown on the drawings or otherwise specified. Before erection or assembly, all bearing surfaces shall be thoroughly cleaned and lubricated with approved high grade oil. After assembly, all lubricating systems shall be filled with the lubricant specified.

31-08. STEEL WALL ARMORING AND PROTECTION ANGLES. - Steel wall armoring and protection angles required for the protection of concrete work shall be erected true to line and grade within the tolerances specified below. The edges of exposed faces may have a vertical or horizontal distortion from a straight line not greater than .025 inch per foot of length; provided, that distortion for any single piece shall not exceed 1/4-inch; and provided, that when the warp is greater than 1/16-inch an extra anchorhole shall be drilled near the proper corner and the piece drawn into position thereby. All bolt heads on the exposed face shall be countersunk and fitted or ground, so that the heads are flush with the finished surface. Joints between abutting sections shall be square and flush and the butting ends shall be sawed or otherwise made smooth and regular.

31-09. METALLIC COATINGS. - a. Zinc Coatings. - Zinc coatings shall be applied in a manner and of a thickness and quality conforming to ASTM specification A123-47.

b. Repair of Zinc Coatings. - All zinc coatings that have been damaged in handling or transporting or in welding, installing or bolting shall be repaired by the application of a thick paste made from galvanizing repair compound conforming to Federal Specification O-G-93 and water. Covers to be repaired shall be cleaned thoroughly, including removal of slag on welds, before the paste is applied. Surfaces to be coated with paste shall be heated with a torch so that all metallics in the paste will be melted when applied to the heated surface. Extreme care shall be taken to see that adjacent zinc-coated surfaces are not damaged by torch. Molten metal shall be spread uniformly over all surfaces to be coated and the excess metal wiped off.

31-10. CASTINGS AND FORGINGS. - a. General. - Each casting shall have the mark number cast upon it. Each casting shall have the heat number stamped or cast upon it. Each forging shall have the mark number stamped upon it. Dimensions of castings shown on the approved shop drawings will be the finish dimensions.

b. Castings. - Repairs to castings shall not be made without the knowledge and prior approval of the Contracting Officer. Where repair welding is permitted, it shall be performed in accordance with the requirements of paragraph 31-03e (6). Warped or otherwise distorted castings or castings that are oversize to such an extent as will interfere with proper fit with other parts of the machinery will be rejected. The structure of the metal in the castings shall be homogeneous and free from excessive nonmetallic inclusions. Excessive segregation of impurities or alloys at critical points in a casting will be cause for its rejection.

31-11. PATTERNS. - In the construction of patterns, care shall be taken to avoid sharp corners or abrupt changes in cross section, and ample fillets shall be used. The contractor shall add such draft and increases in pattern thicknesses as will conform to his standard foundry practice and as may be necessary to insure that all metal thicknesses of the finished castings will be in accordance with the dimensions shown on the drawings within the tolerances specified in paragraph 31-10. All patterns will remain the property of the contractor.

31-12. LISTS OF MATERIALS. - The contractor shall furnish the Contracting Officer with six copies of all purchase orders, mill orders, shop orders for materials, and work orders, including all orders placed or extended by each supplier. Where mill tests are required, the purchase orders shall contain the test site address and the name of the testing agency. The contractor shall also furnish a shipping bill or memorandum of each shipment of finished pieces or members to the project site, giving the designation mark and weight of each piece, the number of pieces, the total weight, and if shipped by rail in carload lots, the car initial and number. Copies of certified shipping bills, in duplicate, shall be mailed promptly to the Contracting Officer.

31-13. SHOP ASSEMBLY. - Unless otherwise specified, each machinery and structural unit furnished shall be assembled in the shop to determine the correctness of the fabrication and matching of the component parts. The tolerances shall not exceed those shown on the drawings and each unit assembled shall be closely checked to insure that all necessary clearances have been provided and that binding does not occur in any moving part. Assembly and disassembly work shall be performed in the presence of a Government inspector, unless waived in writing by the Contracting Officer, and any errors or defects disclosed shall be immediately remedied by the contractor, without cost to the Government. Before disassembly for shipment, each piece of a machine or structure shall be match-marked to facilitate erection in the field. The location of match-marks shall be indicated by circling with a ring of white paint after the shop coat of paint has been applied, or as otherwise directed.

31-14. FIELD ASSEMBLY. - a. General. - All parts to be installed shall be cleaned thoroughly; all packing compounds, rust, dirt, grit, and other foreign matter removed; all holes and grooves for lubrication cleaned; and all enclosed chambers or passages examined to make sure that they are free from injurious materials. Where units or items are shipped as assemblies they will be inspected by a representative of the Contracting Officer prior to installation. Disassembly, cleaning and lubrication will not be required except where there is indication that such work is necessary to place the assembly in a clean and properly lubricated condition. The top of all steel floor plating shall be installed flush with abutting curb surfaces. Stillson wrenches, cold chisels, or other tools likely to cause injury to the surface of rods, nuts, or other parts shall not be used for the work of assembling and tightening parts. Bolts and screws shall be tightened firmly and uniformly, but care shall be taken not to overstress the threads by using excessive force or wrenches of excessive length. When a half nut is used for the purpose of locking a full nut, the former shall be placed first and followed by the latter. Threads of all bolts, nuts, and screws shall be lubricated by graphite and oil before assembly. Driving and drifting bolts or keys will not be permitted.

b. Alignment and Setting. - Each machinery or structural unit shall be accurately aligned by the use of steel shims, or other approved methods, so that no binding in any moving parts of distortion of any members occurs before it is finally fastened in place. The alignment of all parts with respect to each other shall be true within the respective tolerances required. The machines shall be set true to the elevations shown on the drawings.

c. Blocking and Wedges. - All blocking and wedges used for the support, during installation, of parts to be grouted in shall be removed before final grouting, unless otherwise directed by the Contracting Officer. Blocking and wedges left in the foundation with the approval of the Contracting Officer shall be of steel or iron.

d. Foundations and Grouting. - Concreting of sub-bases and frames and the final grouting under parts of machines shall be in accordance with the procedures as specified in Section, CONCRETE.

31-15. TESTS AND TRIALS. - a. General. - The contractor shall at his expense, perform analyses and tests to demonstrate that all materials are in conformity with the specifications, except where such tests are waived in writing by the Contracting Officer. Should the contractor desire to use stock materials, not manufactured specifically for the work covered by these specifications, he shall submit evidence satisfactory to the Contracting Officer that such material conforms to the requirements of the specifications and detail tests of these materials will not be required, if so approved by the Contracting Officer. Tests, except where modified, shall be made as indicated in the respective detailed specifications or on the drawings and, unless otherwise authorized, in the presence of the Contracting Officer. The contractor shall furnish the Contracting Officer certified reports in triplicate of all required analyses and tests. The contractor shall furnish to the Contracting Officer, upon request, specimens and samples for independent analysis and test, all properly labeled and prepared for shipment.

b. Analysis of Material. - The contractor shall furnish the Contracting Officer certificates listing the heat numbers and the chemical and physical properties of the metal from which each article or piece of material was made. There shall be furnished also, two lists; one from the shop showing what pieces or members are to be made from the material ordered, and the other from the mills showing what pieces or members are furnished from each heat or melt.

c. X-Ray and Gamma-Ray Tests. - When doubt exists as to the soundness of any part, such part may be subjected to an X-Ray or Gamma-Ray inspection at the discretion of the Contracting Officer, and the cost of such inspection will be borne by the Government.

31-16. MEASUREMENT AND PAYMENT. - a. Measurement. - All metalwork, for which payment is not otherwise specifically provided elsewhere in these specifications, will be measured for payment on a pound basis. Measurement will be based on computed weights, per fabricated piece or assembly or cast piece for the various metals as classified on the approved shop drawings, except as indicated below. When measurement of complicated shapes can be determined more readily by scale weights per fabricated or cast piece or assembly, the use of certified scale weights may be approved as the basis for measurement.

(1) Computed Weights. - Computed weights for payment shall be the net calculated weights based on the dimensions indicated on the shop drawings. The weight of rolled shapes and plates shall be computed on the basis of their nominal weights and dimensions. In calculating the net weights, all copes, cuts, and all open holes, except rivet and bolt holes shall be deducted. No additional weight shall be calculated for over-weight allowance, rivets, bolts, and washers, protective coatings, allowance for milling, grip length of rivets and bolts, and butt and groove welds. The weight of castings, including fillets will be computed on the basis of the dimensions shown on the shop drawings, deducting for all openings and cuts in the finished casting.

The following weights per cubic inch will be used in computing weights of metalwork and rubber.

Iron Castings	0.260 pounds
Steel (All Compositions)	0.283 pounds
Copper, Bronze, Brass; Nickel-Copper Alloy	0.311 pounds
Lead	0.409 pounds
Aluminum	0.100 pounds
All Other Metals	0.283 pounds
Steel, Pipe and Wrought Iron	Wt. per foot based on computing weight as specified in Fed. Spec. WW-P-406a and WW-P-441b, respectively

(2) Scale Weights. - Unless otherwise specifically authorized, shop scale weight measurements shall be made in the presence of the Contracting Officer. The weight of erection bolts; nuts· washers; as well as boxes, crates and other containers used for packing; and the materials used for supporting members during transportation, will not be included in the scale weights. It shall be the responsibility of the contractor to prepare the shipping lists, furnished in accordance with paragraph 31-13, in such a manner as to make possible the correct allocation of the scale weights of individual metal parts and members to the applicable payment classifications. Failure to comply with this

requirement, to the satisfaction of the Contracting Officer, will necessitate measurement by computed weights. The weight of shop applied protective coatings will not be deducted from scale weights.

b. Payments. - Payments for all metalwork, not included under other items, covered by this section will be made at the contract price per pound for each applicable item of the Unit Price Schedule. The contract prices will include all costs for material and work for fabricating, shop and field painting, placing the metals shown on the drawings or required by these specifications, and for galvanizing or other metallic coatings, unless otherwise specified. Where payment is based on scale weights, no payment will be made for material in excess of a variation of 4 percent for fabricated shapes, bars, and plates, and 5 percent for castings and forgings, from the net weight as calculated from the dimensions shown on the approved shop drawings, unless otherwise authorized by the Contracting Officer. Except where the payment item is specifically indicated on the drawings or specified herein, no separate payment will be made for bolts, nuts, pins, washers, studs and strap hangers, and the cost of such items shall be included in the unit prices of items on which they are used.

c. Partial Payment. - Unless otherwise specified, partial payments for metalwork which is covered by this section will be included in the regular payment estimate, following delivery, acceptance and satisfactory storage of the material, provided that such payments do not represent a disproportionate amount of the total funds available for the work to which the material pertains. Such payments will be determined on the basis of the contract unit price for the item, and the delivered cost of the material to the contractor. A sufficient amount will be retained to insure proper storage and installation of the material. If any material partially paid for is not protected in a satisfactory manner, the material will be protected by the Contracting Officer and any costs therefor will be borne by the contractor. (See paragraph GC-8, "Protection of Material and Work)".

Serial No. CIVENG-19-016-62-49

CONNECTICUT RIVER FLOOD CONTROL PROJECT
SPECIFICATIONS
FOR
CONSTRUCTION
OF
LITTLEVILLE DAM
AND
APPURTENANT STRUCTURES
MIDDLE BRANCH, WESTFIELD RIVER
MASSACHUSETTS

VOLUME III OF III

Technical Provisions
(Sections 32 - 43)

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND

CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS

TABLE OF CONTENTS

VOLUME I OF III

INVITATION FOR BIDS

BID FORM

PART I - GENERAL CONDITIONS

PART II - SPECIAL CONDITIONS

PART III - TECHNICAL PROVISIONS

Section No.	Title
1	PREPARATION OF SITE
2	CONTROL OF DIVERSION OF WATER
3	EXCAVATION - OPEN CUT
4	EXCAVATION - TUNNEL AND SHAFT - ITEMS 7 & 8
5	ROCK BOLTING
6	TUNNEL RIB SUPPORTS
7	EMBANKMENTS
8	ROCK SLOPE PROTECTION, SELECTED RIPRAP AND GRAVEL BEDDING
9	MISCELLANEOUS FILLS, ROADS, DRIVES, AND PARKING AREAS
10	CULVERT
11	FOUNDATION DRILLING AND GROUTING
12	TUNNEL GROUTING
13	ANCHOR BARS
14	CONCRETE

VOLUME II OF III

Section No.	Title
15	48-INCH WATER SUPPLY PIPE
16	WATER SUPPLY INTAKE TOWER AND FLOOD CONTROL GATE SHAFT - MISCELLANEOUS
17	FLOAT WELL AND AIR VENT
18	SLUICE GATES, VALVES AND ACCESSORIES
19	OMITTED
20	OMITTED
21	OMITTED
22	TRAVELING CRANES
23	DIESEL ENGINE-GENERATOR SET
24	VENTILATING SYSTEM, MECHANICAL
25	ELECTRICAL WORK; INTERIOR
26	HEATING SYSTEMS, FORCED-WARM-AIR: OIL-FIRED FURNACE
27	ELECTRICAL-EXTERIOR
28	STRUCTURAL STEEL BRIDGES
29	MISCELLANEOUS METAL ITEMS
30	METALS, MISCELLANEOUS MATERIALS AND STANDARD ARTICLES
31	METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS

VOLUME III OF III

Section No.	Title
32	TRENCH EXCAVATION AND BACKFILLING FOR UTILITIES, DRAINS AND CULVERTS
33	MISCELLANEOUS ITEMS OF WORK
34	UTILITY BUILDING, OPERATORS' QUARTERS AND GARAGE
35	PLUMBING, GENERAL-PURPOSE
36	HEATING SYSTEM; FORCED-HOT-WATER, OIL-FIRED
37	WATER SUPPLY WELLS
38	WATER AND SEWER SYSTEMS
39	OMITTED
40	PAINTING
41	BITUMINOUS CONCRETE PAVEMENT
42	BITUMINOUS SURFACE TREATMENT
43	TOPSOILING, SEEDING AND MULCHING

SECTION 32

TRENCH EXCAVATION AND BACKFILLING FOR UTILITIES, DRAINS AND CULVERTS

INDEX

Paragraph No.	Paragraph Title	Page No.
32-01	Scope	32-1
32-02	Excavation	32-1
	a. General	32-1
	b. Trench Excavation	32-1
	c. Excavation for Appurtenances	32-2
32-03	Backfilling	32-2
32-04	Measurement and Payment	32-2
	a. Trench Excavation - Earth and Backfill	32-3
	b. Trench Excavation-Rock	32-3
	c. Sheeting Left in Place	32-4

SECTION 32

TRENCH EXCAVATION AND BACKFILLING FOR UTILITIES, DRAINS AND CULVERTS

32-01. SCOPE. - Work covered by this section consists of furnishing all plant, labor, equipment, appliances and materials and performing all operations in connection with excavation, trenching and backfilling for drains, culvert, underground utilities and appurtenant structures to the points of connection with the building utilities 5 feet outside of the buildings except as otherwise specified, or indicated, complete, as shown on the drawings and specified hereinafter.

32-02. EXCAVATION. - a. General. - The contractor shall perform all excavation of every description and of whatever substances encountered, to the depths indicated on the drawings or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or not suitable for backfill shall be removed and wasted in specified spoil areas as indicated on the drawings or as directed by the Contracting Officer. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavation, and any water accumulating therein shall be removed by pumping or by other approved method. Such sheeting and shoring shall be done as may be necessary, for the protection of the work and for the safety of personnel. Excavation shall be classified as stated in Section "Excavation - Open Cut" except that boulders measuring one cubic yard or more in volume shall be classified as rock excavation.

b. Trench Excavation. - Trenches shall be of necessary width for the proper laying of the pipe as specified in other sections for the particular utility, and the banks shall be as nearly vertical as practicable. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for pipe bells and for the proper sealing of pipe joints. Bell holes and depressions for joints shall be excavated no larger than necessary for properly making the particular type of joint. Except where bedrock or boulders are encountered, care shall be taken not to excavate below the depths indicated. Where bedrock is encountered, the bedrock shall be excavated to a minimum overdepth of 6 inches below the trench depths indicated on the drawings or specified. Overdepths in the rock excavation, unauthorized overdepths and overdepths due to removal of boulders, shall be backfilled with compacted pervious backfill in accordance with the applicable requirements of Section 7. Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe, as determined by the Contracting Officer, is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trench shall be backfilled to the proper grade with compacted pervious backfill in accordance with the applicable requirements of Section 7. Special requirements are as follows:

(1) Sewers, Culverts and Drains. - For sewers, culverts and drains, the width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench will shall not exceed 8 inches on either side of the pipe. The width of the trench above that level may be as wide as necessary for sheeting and bracing and performance of the work. The bottom of the trench shall be rounded so that at least the bottom quadrant of the pipe shall rest firmly on undisturbed soil for as nearly the full length of the barrel proper as jointing operations will permit. This part of the excavation shall be done manually only a few feet in advance of the pipe laying by men skilled in this type of work.

(2) Water Supply System. - Trenches for water lines shall be of a depth that will provide the minimum cover of 5'-0" over the top of the pipe measured from the existing ground surface or the indicated finished grade, whichever is lower, and avoid interference of the water lines with other utilities.

c. Excavation for Appurtenances. - Excavation for manholes, tanks, valve boxes, and similar structures shall be sufficient to leave at least 12 inches in the clear between their outer surfaces and the excavated surface of timber which may be used to hold and protect the banks. Any overdepth excavation below such appurtenances that has not been directed by the Contracting Officer shall be considered as unauthorized and shall be backfilled to the desired grade in accordance with the applicable requirements of Section 7, or with concrete as directed and at the expense of the contractor.

32-03. BACKFILLING. - The trenches shall not be backfilled until all specified tests are performed and until the utilities systems, as installed, conform to the requirements specified in the several sections covering the installation of the various utilities. Where, in the opinion of the Contracting Officer, damage is likely to result from withdrawing the sheeting, the sheeting shall be left in place and the contract price will be adjusted accordingly. The trenches shall be carefully backfilled with material free from stumps, roots, sod, frozen soil, large stone, rubbish, or other unsuitable materials. The backfill material shall consist essentially of the same material as excavated from the required excavation with large stones removed for uncompacted backfill and stones with a maximum dimension greater than 3 inches removed for compacted backfill. It shall be deposited in 4-inch layers and thoroughly and carefully compacted until the pipe or other utilities has a cover of not less than 2 feet. Except as stated below, the remainder of the backfill materials shall then be placed into the trenches by use of a bulldozer or other approved equipment, unless otherwise directed, to insure no damage to pipes. The surface of the uncompacted backfill shall be mounded above the required grade and the backfill shall be compacted with 4 coverages of a thread of a crawler type tractor traveling lengthwise of the trench. The surface of the backfill shall be left in a mounded condition except in graded areas where the mounds will be smoothed off during grading. Portions of trenches across areas to be paved and foundation areas for curbs, sidewalks, concrete slabs and other structures and other areas where, in the opinion of the Contracting Officer, a compaction is required to prevent settlement detrimental to a structure shall be backfilled as specified above, except that the backfill for the entire depth of the trench shall be spread in 4-inch layers and each layer shall be compacted by 4 coverages of approved power tampers. Backfill for drainage and appurtenant structures shall be as specified for backfill around and over pipes. If no pipes adjoin the structure, backfill shall be as specified above for backfill over pipes after the two foot cover is placed. Uncompacted backfill under tanks and overhanging portions of structures shall be placed in a manner to insure complete filling of the excavated area.

32-04. MEASUREMENT AND PAYMENT. - a. Trench Excavation - Earth and Backfill. - No separate payment will be made for unclassified excavation or backfill or refill required for the construction of underground utilities, drains and culverts and all costs thereof shall be included in the applicable contract unit or lump sum prices for the specific utility or drainage system or culverts or appurtenant structure. Payment of these items will constitute full compensation for excavation (except classified rock) and backfilling, including the additional width of excavation at manholes and similar structures, placement of bedding materials, and including the furnishing, placing and removal of sheeting and bracing, and all incidentals necessary to complete the work required by this section of the specifications.

b. Trench Excavation - Rock. - The quantity of rock excavation to be paid for will be the number of cubic yards of actual total volume of boulders greater than 1 cubic yard in size removed during the excavation operations and the volume of acceptably excavated bedrock material as hereinbefore specified and defined as rock excavation, measured in its original position, and computed by allowing a 30-inch width of excavation of bedrock. The measurement will include authorized overdepth rock excavtion. In rock excavation for manholes and other appurtenances, one foot will be allowed outside of the wall lines of the structures. Payment for rock excavation will be made at the applicable contract unit price for "Rock Excavation General" for the specific site of the work and will include all necessary drilling and blasting, and all incidentals necessary to satisfactorily excavate and dispose of authorized rock excavation. No extra payment will be made for the placement of bedding materials and these costs shall be included in the applicable contract unit price per cubic yard of Rock Excavation General.

c. Sheeting Left in Place. - In the event sheeting is directed to be left in place, a suitable adjustment will be in the contract.

SECTION 33

MISCELLANEOUS ITEMS OF WORK
(Item 72, and 88 thru 93, incl.)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
33-01	Scope	33-1
33-02	Tile Gages	33-1
	a. General	33-1
	b. Construction	33-1
	c. Payment	33-1
33-03	Chain Link Fencing - 4 Feet	33-1
	a. General	33-1
	b. Material and Description	33-1
	c. Payment	33-2
33-04	Chain Link Fencing 7 Feet	33-2
	a. General	33-2
	b. Materials	33-2
	c. Installation	33-3
	d. Payment	33-3
33-05	Flagpoles and Base	33-4
	a. General	33-4
	b. Material	33-4
	c. Construction Methods	33-4
	d. Flagpole Base	33-4
	e. Grounding	33-4
	f. Payment	33-4
33-06	Log Boom	33-5
	a. General	33-5
	b. Materials	33-5
	c. Construction	33-5
	d. Payment	33-5
33-07	Highway Guard Rail and Guard Posts	33-5

Paragraph No.	Paragraph Title	Page No.
	a. Highway Cable Guard Rail	33-6
	b. Guard Posts	33-6
	c. Measurement and Payment	33-6
33-08	Precast Concrete Curb	33-6
	a. Gravel	33-7
	b. Excavation	33-7
	c. Curb Foundation	33-7
	d. Setting Curb	33-7
	e. Protection	33-7
	f. Backfilling	33-8
	g. Payment	33-8

SECTION 33

MISCELLANEOUS ITEMS OF WORK

(Item 72, and 88 thru 93, incl.)

33-01. SCOPE. - The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with miscellaneous work items listed below, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

33-02. TILE GAGES. - a. General. - The contractor shall install the tile gages at the locations and in accordance with the design and dimensions shown on the drawings.

b. Construction. - The tile gages shall be erected in sections as shown on the drawings, and shall be constructed of black figures on glazed white field of ceramic tile of standard manufacture. The tile shall be assembled by pasting on sheets of paper in panels of 1 foot lengths; a sample shall be furnished to the Contracting Officer for approval before erection. Figure sheets as received from the manufacturers shall be placed in an accurate mold on a glass plate and backed with cement mortar about 1-1/2 inch thick; the mortar shall be a 1 to 1 mixture of cement and sand of suitable consistency when combined with water, and shall be reinforced with expanded metal or wire fabric. Reinforcing shall extend beyond both edges of the mortar to form anchorages as shown on the drawings. After final set, molds shall be removed and the panels shall be cured by immersion in water for a period of 10 days. The tile panels may be prepared in convenient lengths of even feet.

c. Payment. - Payment for the tile gages as specified above, complete and accepted, will be made at the applicable contract lump sum prices for Item No. 72, "Tile Gages", and shall include all costs in connection therewith, including cost of cement, concrete, grout holding panels and reinforcement.

33-03. CHAIN LINK FENCING - 4 FEET. - a. General. - Chain link fencing four feet in height shall be installed where and as shown on the drawings. Fencing shall be braced at changes in direction at ends, and where 4-foot fencing meets 7-foot transformer pen fencing in accordance with manufacturer's recommendations.

b. Material and Description. - (1) Posts shall be galvanized and shall be in accordance with Federal Specification RR-F-183. Line

49

posts shall be 2" O.D. tubular steel pipe weighing at least 2.7 lbs. per lin. ft. Top railings shall be 1-5/8" O.D. tubular steel pipe weighing at least 2.28 pounds per linear foot. End, corner and angle posts shall be 3 inch O.D. tubular steel pipe weighing at least 5.79 pounds per linear foot. The line posts shall be spaced not more than 10 feet on centers and embedded in the manner and depth shown on the drawings. All posts shall have an ornamental ball top.

(2) The fencing fabric shall conform to the requirements of Federal Specification RR-F-191a, Type A. The fabric shall be made of 2 inch diamond mesh (4 foot high) chain link, galvanized steel wire fencing, No. 9 gage. The fencing shall be set to line and grade as shown on the drawings or as directed. Both edges of the fabric shall have a knuckled finish. The fence shall have top rail not less than 1-5/8 inches (2.28 pounds per linear foot) nominal outside diameter, galvanized, tubular steel pipe. Tension wire along bottom of fabric shall be zinc coated No. 6 or 7 coil spring wire.

(3) Aluminum fabric ties of suitable gage shall be provided for attaching the wire mesh to the posts.

(4) The fencing shall be constructed and installed as herein specified and in accordance with the best methods for workmanship adopted for this type of work in accordance with manufacturers' instructions and shall be pursued to a satisfactory completion as approved by the Contracting Officer.

c. Payment. - Payment for funishing and installing 4 foot high chain link fencing will be made at the applicable contract unit prices per lineal foot for Item No. 90, "Chain Link Fencing - 4 Feet High", measured along the fence line between the end posts. The contract price shall include all costs in connection with earth and rock excavation, concrete foundations, and grouting sockets.

33-04. CHAIN LINK FENCING 7 FEET. - a. General. - Chain link fencing, 6 feet in height with one foot extension arm, including gage, shall be installed where and as shown on the drawings for the transformer pen. Fencing shall conform to Drawing No. 40-16-03, attached at end of Section. Fencing shall be braced at gate and corners in accordance with the manufacturer's recommendations.

b. Materials. - (1) All materials including posts shall be galvanized and shall be in accordance with the applicable requirements of Federal Specification RR-F-183. Line posts shall be 2-1/2 inch O.D. tubular steel pipe weighing at least 3.65 pounds per linear foot or 2-1/4 inch H section not less than 4.1 lbs per linear foot. Railings shall be 1-5/8 inch O.D. tubular steel pipe weighing at least 2.28

pounds per linear foot. End and corner posts and gate posts shall be 3 inch O.D. tubular steel pipe weighing at least 5.79 lbs., per linear foot. The line posts shall be spaced not more than 10 feet on centers and embedded in the manner and depth shown on the drawings.

(2) The fencing fabric shall conform to the requirements of Federal Specification RR-F-191a, Type A. The fabric shall be made of 2 inch diamond mesh, 6 feet in height, chain link galvanized steel wire fencing, No. 9 gage. The fencing shall be set to line and grade as shown on the drawings or as directed. Both ends of the fabric shall have a twisted and barbed top and bottom edges. Barbed wire shall be 4-point barbed wire.

c. Installation. - (1) General. - The fence shall follow the profiles of the ground. Depressions shall be filled with fabric or compacted earth fill. In the event fill is provided, it shall not interfere with natural ground drainage. Bottom edge of fabric shall be two inches above ground, concrete, or fill as the case may be.

(2) Fence. - Posts shall be set in concrete or leaded into sockets, as applicable, at approximately 10 foot intervals as shown on the drawings. Bases shall extend at least 4'-0" below grade. The fabric shall be stretched to give proper tension and shall be attached to rails with No. 6 gage aluminum bands, and attached with not less than six No. 6 gage aluminum bands to every intermediate post. Extension arms shall be provided for all fencing.

(3) Gate. - Gate shall be of width noted on the drawings and constructed with malleable iron fittings, securely braced and trussed up with welded connections. Gate shall be provided with a positive stop. Gate shall be filled with fabric to match fencing and shall have 3 strands of barbed wire. Gate shall be equipped with pivot type malleable iron hinges and brass padlock. Gate shall be provided with fork latch with provisions for padlocking. Padlock (Type EPC, size 2-inch with chain) shall be provided for gate.

(4) Terminal Posts. - Terminal posts shall be fastened with steel stretcher bar bands and 3/8 inch diameter rods with turnbuckles. Tension bars shall be 3/16 inch by 3/16 inch by 3/4 inch high carbon steel attached to terminal posts by means of beveled edged bands.

(5) Concrete. - The concrete shall be well rodded, spaded, and tamped as necessary.

d. Payment. - No separate payment will be made for the work specified in this paragraph and payment for furnishing and installing chain link fencing 7 feet high, including gate, will be included in the lump sum contract price for Item No. 87, "Electrical Work, Exterior".

33-05. FLAGPOLE AND BASE. - a. General. - The contractor shall install the flagpole and base, as shown on the drawings and as specified and shall construct concrete walk as shown.

b. Material. - The base shall be constructed of reinforced concrete conforming to the requirements of Section 10, CONCRETE. The flagpole shall be machine made of 6063-T6 seamless cold drawn aluminum of 3/16 inch wall thickness and have a uniform conical taper throughout the tapered portion. The pole shall have a smooth uninterrupted exterior surface without visible joints or offsets, shall have a machined satin brush finish and shall be shipped in one piece. Accessories to be furnished by the contractor include: A 14-gage aluminum 8-inch diameter satin finished ball; an aluminum body non-fouling truck revolving on an aluminum spindle with ball race and stainless steel balls, fitted with two 2-3/8 inch diameter aluminum sheaves rotating on 3/8 inch dural pins; two sets of 5/16 inch diameter #10 cotton braided rope halyards each with two aluminum snaps for securing to flag; two 9-inch cast aluminum cleats each attached to the pole with flat head dural machine screws. All aluminum surfaces shall have a heavily waxed finish.

c. Construction Methods. - The flagpole shall be set in the concrete foundation as indicated on the drawings. The erection of the flagpole shall be in strict accordance with the manufacturer's specifications.

d. Flagpole Base. - The forms shall be removed as soon as practicable. The exposed surfaces shall be thoroughly wetted and rubbed with No. 20 corundum stones. The lather that works upon the surface shall be removed by brushing and washing. Small voids in the surface shall be filled with a mortar composed of one part cement and two parts of the same sand used in the concrete. The mortar shall be worked into the surface with the corundum stones so that no appreciable thickness of coating remains. After a period of approximately 4 weeks, the surfaces shall again be thoroughly wetted and rubbed down with No. 24 corundum stones. The lather that works up shall be removed with a clean wet brush.

e. Grounding. - The flagpoles shall be grounded as indicated on the drawings. The two-hole bi-metallic tongue terminal lug shall be attached to the flagpole using dural machine bolts.

f. Payment. - Payment will be made at the contract lump sum price for Item No. 92, "Flagpole" and which price shall include all costs of excavation and backfilling, furnishing, assembling, erecting, cleaning the flagpole and construction of concrete base and concrete walk including cement, concrete, reinforcing steel and grounding.

33-06. LOG BOOM. - a. General. - The contractor shall furnish, construct and erect log boom at the location upstream of the dam as indicated on the drawings. Concrete shall conform to the requirements of Section "CONCRETE".

b. Materials. - (1) Boom logs shall be white pine or spruce having a minimum diameter of 10 inches at the tip and shall be furnished in 18 foot to 20 foot lengths, except the maximum length shall be reduced to follow final finish grade and permanent pool elevations and to avoid abrupt changes, and shall be bored with a 2-1/4 inch hole at each end. Logs shall be sound, straight, free from rot, and shall be approved prior to use. To the extent such logs are available, the contractor shall use logs obtained in the course of clearing operations. The steel piles and anchors shall be the size indicated on the drawings. The steel shall conform to Federal Specification QQ-S-751a for "Steel; Structural (including Steel for Cold Flanging) and Steel Rivet; (for) ships other than Naval Vessels".

(2) Boom cable shall be new 3/4 inch galvanized wire rope 3 strand, 7 wires to the strand, conforming to the requirements of Federal Specification RR-R-571a for "Rope, Wire", Type III, preformed.

(3) Boom chains shall be fabricated from 1/2 inch galvanized stock, approximately 5-1/2 feet long, overall, similar and approved equal to American Chain Co., Type "B". The rings and toggles shall meet the same specifications for the boom chains.

c. Construction. - A hole approximately 2-1/4 inch in diameter shall be bored through each end of the log. The log shall be connected end to end by passing the boom chains through the bored holes and the whole assembly reinforced by threading the 3/4 inch wire rope through the rings of the boom chains. The ends of the cable shall be anchored to the steel piles embedded in concrete or earth, as shown on the drawings.

d. Payment. - Payment for the log booms complete as specified, will be made at the contract lump sum price for Item No. 93, "Log Boom", and shall include all costs in connection therewith, including all metallic items, painting and end anchorages.

33-07. HIGHWAY GUARD RAIL AND GUARD POSTS. - Highway cable guard rail and guard posts shall be installed where and as indicated on the drawings.

a. Highway Cable Guard Rail. - Highway cable guard rail shall be 2 cable type guard rail (type C2C) with concrete posts conforming to the requirements of Standard Specifications for Highways and Bridges as issued by the Commonwealth of Massachusetts under Section E-2, except as otherwise indicated on the drawings or specified.

b. Guard Posts. - Guard posts shall conform to the applicable requirements as specified above for highway guard rail, except as otherwise indicated on the drawings.

c. Measurement and Payment. - (1) Guard Rail measurement will be made by linear foot of cable guard rail satisfactorily installed measured between centerlines of end posts. Payment will be at the contract unit price for Item 88, "Cable Guard Rail", which price shall include all costs in connection with providing the guard rail complete with concrete posts, including cement, accessories, bracing, I beam end posts and concrete bases at Service and access bridges, excavation, backfill, painting and disposal of surplus materials.

(2) Payment for guard posts, exclusive of those for highway guard rail, will be made at the contract unit price each for Item 89, "Guard Posts" for the number of posts installed and shall include all costs of excavation, backfill, painting and disposal of surplus materials except for chains, attachments and padlocks. Chains, attachments and padlocks will be measured and paid for under Item, "Miscellaneous Metals".

33-08. PRECAST CONCRETE CURB. - All precast cement concrete curb (straight and curved) shall be certified to conform to the requirements of this paragraph.

Precast concrete curb shall consist of air entrained concrete castings conforming to the size and dimensions shown on the plans. Straight and curved curb shall be cast in standard lengths of 6 feet. Straight and curved curb may be cast in lengths not less than 4 feet where necessary and as directed. Curb on a radius of 150 feet or less shall be cast to the correct radius. Portland Cement shall conform to Federal Specification SS-C-192d, Type I or Type II. Cement will be accepted on the basis of mill certificates of compliance with the Federal Specification. Forms shall be metal or wood and shall be tight, rigid construction, true to shape and with a smooth finish. Concrete forms may be used if approved by the Contracting Officer. Concrete shall be air entrained with a minimum allowable compressive strength at 28 days of 3000 pounds per square inch. Air-entrained concrete shall be designed for 5.5 percent air. Upon removal from the forms, the top and eight inches of the face shall be rubbed with a carborundum brick in an approved manner to fully remove any cement enamel finish. No cement shall be used in the process. Next, a mixture of fine sand, cement and water shall be thoroughly ground into the surface of the curb with a carborundum stone until the resulting paste fills any minor imperfections left by the form. A cork float shall then be used to pick up all excess paste and to put a final finish on the curb resembling sandstone in appearance. The color and finish of the castings shall be uniform, and shall conform to those of adjacent work in final position. Immediately after finishing, the castings shall be entirely covered and fully cured under the double thickness of saturated burlap or by an equivalent approved method for a period of 7 days at a temperature of not less than 60 degrees F. The burlap shall be kept thoroughly saturated for the entire curing period. Upon delivery, the castings shall be wetted and inspected for crazing, any evidence of which will cause rejection.

a. Gravel. - Gravel shall consist of hard, durable stone coarse sand, uniformly graded from coarse to fine and containing no stone having any dimension greater than two (2) inches. The grading shall conform to the following requirements:

Passing 3/8 inch Sieve	40% min.	70% max.
No. 4	25% min.	50% max.
No. 200		5% max.

Not more than 3% shall pass the 0.02 mm.

b. Excavation. - The trench for the curb shall be excavated to a width of 18 inches. The subgrade of the trench shall be a depth below the proposed finish grade of the curb equal to 6 inches plus the depth of the curbstone. Whenever wet or otherwise unsuitable soil that is incapable of properly supporting the curbing, as determined by the Contracting Officer, is encountered in the bottom of the excavation, such soil shall be removed to the depth required and backfilled to the proper grade with coarse sand, fine gravel, or other suitable materials and thoroughly tamped.

c. Curb Foundation. - The foundation for the curb shall consist of gravel spread upon the subgrade and, after being thoroughly compacted by tamping, shall be 6 inches in depth.

d. Setting Curb. - Upon the foundation additional gravel shall be spread as required and the precast concrete curb shall be set thereon. All spaces under the curbstones shall be filled with gravel, thoroughly rammed so that the curbstones will be completely supported throughout their length. The curb shall be set at the line and grade required as shown on the plans or as directed by the Contracting Officer. The curb castings shall be laid so as to not fit closer to each other at any point than 1/4 inch, and they shall not be farther apart than 1/2 inch.

e. Protection. - The contractor shall protect the curb and keep them in first class condition until the completion of the entire contract. Any curb which is damaged at any time previous to final acceptance of the work shall be removed and replaced with a satisfactory casting at the contractor's expense.

f. Backfilling. - After the curbing is set, the space between it and the wall of the trench shall be filled with gravel thoroughly tamped, to the depth shown on the plans, care being taken not to affect the line or the grade of the curb.

g. Payment. - Curb will be measured by the linear feet of curb installed and accepted measured along the top of curb to the nearest 0.1 of a foot. Payment will be made at the contract unit price for Item 91, "Precast Concrete Curb", which price shall include furnishing and placing curb, and excavation, gravel and backfilling.

SECTION 34

UTILITY BUILDING, OPERATORS' QUARTERS AND GARAGE
(Items 96, 97, & 98)

(Index)

Paragraph No.	Paragraph Title	Page No.
34-01	Scope	34-1
34-02	Description of the Work	34-1
34-03	Drawings and Samples for Approval	34-1
	a. General	34-1
	b. Samples	34-1
34-04	Excavation, Backfilling and Grading	34-2
	a. General	34-2
	b. Grading	34-2
	c. Excavation	34-2
	d. Excess Material	34-2
	e. Sand and Gravel Fill	34-2
	f. Topsoil, Fertilizing and Seeding	34-3
	g. Trench Excavation	34-3
	h. Filling Near Foundation Walls	34-3
	i. Backfilling	34-3
34-05	Concrete	34-3
	a. General	34-3
	b. Splash Blocks	34-4
	c. Concrete Stairs and Platforms	34-4
	d. Slab on Grade	34-4
	e. Polyethylene Protective Sheeting	34-5
34-06	Dampproofing	34-5
34-07	Masonry Work	34-6
	a. Materials	34-6
	b. Handling and Storage of Materials	34-7
	c. Erection	34-7
	d. Pointing	34-8
	e. Cutting and Patching	34-8
	f. Unfinished Work	34-8
	g. Protection of Finished Work	34-8
	h. Calking	34-8
	i. Pointing and Cleaning	34-9

Paragraph No.	Paragraph Title	Page No.
34-08	Sheet Metal Work and Miscellaneous Metals	34-9
	a. Materials	34-9
	b. Soldering and Seaming	34-9
	c. Downspouts and Flashings	34-10
	d. Metal Clad Door and Frame	34-11
	e. Metal Ventilator	34-11
	f. Wire Grill	34-11
	g. Miscellaneous Sheet Metalwork	34-12
	h. Weatherstripping	34-12
	i. Aluminum Ladder	34-12
	j. Metal Combination Storm and Screen Doors	34-12
	k. Mirrors	34-12
	l. Cabinet for Paper Towels	34-13
	m. Metal Toilet Enclosures and Partitions	34-13
	n. Metal Louvers	34-13
	o. Metal Lavatory Shelves	34-13
	p. Bulkhead	34-13
	q. Medicine Cabinet	34-13
	r. Chimney Cleanout Doors	34-14
	s. Concrete-Filled Pipe Columns	34-14
	t. Metal Thresholds	34-14
	u. Clothes Poles	34-14
	v. Wrought Iron Hand Rails	34-14
	w. Extension Traverse Rods	34-15
	x. Heater Room Door (Interior door)	34-15
	y. Robe Hook	34-15
	z. Basement Windows	34-15
34-09	Carpentry	34-15
	a. Lumber and Woodwork	34-15
	b. Other Materials	34-17
	c. Framing and Boarding	34-19
	d. Insulation	34-20
	e. Exterior Finish	34-21
	f. Wood Louver Ventilators	34-21
	g. Window Frames	34-21
	h. Sash	34-22
	i. Storm Sash	34-22
	j. Insect Screens	34-22
	k. Door Frames	34-23
	l. Doors	34-23
	m. Blocking, Strapping and Furring	34-25
	n. Interior Finish	34-25
	o. Kitchen Cabinets and Counters	34-26
	p. Planter	34-27
	q. Access Panel	34-27

Paragraph No.	Paragraph Title	Page No.
34-10	Asphalt Tile	34-27
	a. General	34-27
	b. Materials	34-27
	c. Design	34-28
	d. Preparation of Subfloor	34-28
	e. Installation	34-28
	f. Cleaning	34-28
	g. Protection	34-29
34-11	Lathing and Plastering	34-29
	a. General	34-29
	b. Materials	34-29
	c. Delivery and Storage	34-31
	d. Installation	34-31
	e. Grounds	34-32
	f. Mixing of Plaster	34-32
	g. Proportioning	34-32
	h. Application of Plaster	34-33
	i. Sampling	34-34
	j. Patching	34-34
	k. Marble Threshold	34-35
34-12	Ceramic Tile	34-35
	a. General	34-35
	b. Materials	34-35
	c. Accessories	34-36
	d. Installation of Floor Tile	34-36
	e. Installation of Wall Tile	34-37
	f. Cleaning	34-38
	g. Curing and Protection	34-38
34-13	Linoleum	34-38
	a. Materials	34-38
	b. Preparation of Subfloor	34-39
	c. Application of Felt Lining	34-39
	d. Application of Linoleum	34-39
	e. Edge Strips	34-40
	f. Cleaning	34-40
	g. Protection	34-40
34-14	Builders' Hardware	34-40
	a. General	34-40
	b. Lock Sets	34-40
	c. Materials	34-40
	d. Keys	34-43
	e. Finish	34-43

Paragraph No.	Paragraph Title	Page No.
34-15	Roofing	34-43
34-16	Shades	34-43
	a. General	34-43
	b. Materials	34-43
	c. Installation	34-44
34-17	Payment	34-44

SECTION 34

UTILITY BUILDING, OPERATORS' QUARTERS AND GARAGE
(Items 96, 97, & 98)

34-01. SCOPE. - The work covered by this section of the specifications consists in furnishing all labor, plant, equipment, materials and appliances, and performing all operations in connection with construction of the Operators' Quarters, Garage and Utility Building, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

34-02. DESCRIPTION OF THE WORK. - a. General. - The buildings shall be of wood frame construction on concrete foundations, asphalt shingle roofs, concrete and wood floors, and shall be complete with plumbing, heating, and electrical systems. Construction of utility lines to line 5 outside the buildings are included with the buildings.

b. All concrete walks from the road to the house and from the house to the garage shall be included for payment with the Operators' Quarters.

34-03. DRAWINGS AND SAMPLES FOR APPROVAL. - a. General. - Before fabricating metal toilet partitions, shop fabricated sheet metal items, wrought iron rails, metal storm doors, metal louvers, metal ventilator, and thresholds and weatherstripping for doors, detailed shop drawings supplemented by descriptive data shall be submitted for approval. Hardware schedules shall be submitted for approval prior to furnishing.

b. Samples. - Before delivery of any material to the site, the following samples shall be submitted for approval:

(1) All brick proposed for use in the above work.

(2) Insulation and tempered fiberboard.

(3) Asphalt tile and linoleum. - Samples, color chips and patterns shall be submitted for approval before the delivery of any tile, linoleum, felt, primer, cement and edging strips to the project site. Certificates of compliance shall be furnished for the above materials. Three sample tiles and two 12" x 12" pieces of linoleum shall be furnished.

(4) Ceramic Tile. - Two panels of wall and floor tiles for each color used. Two pieces of each tile shape used. One quart of adhesive and primer. Descriptive literature for accessories.

(5) Laminated Plastic. - Samples to show variation of standard colors compatible with linoleum furnished.

(6) Flagstone. - Sample 6" x 6" to show color range.

34-04. EXCAVATION, BACKFILLING AND GRADING. - a. General. - All work shall be executed to the lines and grades shown on the drawings. Shoring and unwatering the construction area shall conform to the applicable requirements of Section 3, EXCAVATION, and as stated below. Excavation shall be classified in Section 3 of these specifications except, that rock excavation shall include the removal of any boulder greater than 1 cubic yard in size.

b. Grading. - The entire Utility Building Area, and the Operators' Quarters Area shall be rough graded under the applicable requirements of Sections 3 and 9 prior to excavation or fill for the building foundations. Fill under Section 9 shall be brought up to the underside of subgrade for sand and gravel drainage fill under slabs and for topsoil.

c. Excavation. - Excavations shall conform to the dimensions and elevations shown on the drawings or as required for the construction of features covered in this section and shall include trenching for utility systems for the buildings to a line 5 feet outside the buildings and all work incidental thereto. Where suitable bearings are encountered at different elevations from those indicated on the drawings, the Contracting Officer may direct in writing that the excavation be carried to elevations above or below those indicated on the drawings, and an equitable adjustment will be made to the contract. Where the excavation is made below the elevations indicated on the drawings or directed, the excavation, if under slabs, shall be restored to the proper elevation in accordance with the prcedure hereinafter specified for fill, or if under footings, the depths of the walls or footing shall be increased, as may be directed. Excavation shall generally extend 12 inches outside the walls and footings to allow for placing and removal of forms, installation of services, and for inspection. Undercutting will not be permitted. Suitable excavated material which is required for fill under slabs shall be separately stockpiled as directed.

d. Excess Material. - Material from excavation, not required for fill or backfill, shall be used or disposed of as specified for material removed by unclassified excavation, general, in Section 3 of these specifications.

e. Sand and Gravel Fill. - Sand and gravel fill under concrete slabs and elsewhere as indicated on the drawings shall meet all the requirements for Gravel Fill Material as specified in Section 7, except that the material shall contain no stones greater than 3 inches in size. Irregularities in the rock surface within the Utility Building shall be filled with sand and gravel fill in layers not exceeding 4-inches in thickness, each layer being compacted by saturation and pneumatic tampers. The 6-inch layer of sand and gravel fill beneath floor slabs shall be compacted by four coverages of vibratory compactors or pneumatic tampers.

f. Topsoil, Fertilizing and Seeding. - Topsoil, fertilizing and seeding as required around the buildings shall be in accordance with Section 43, TOPSOILING, SEEDING AND MULCHING.

g. Trench Excavation. - All materials in the trenches for water and sewer pipes to a line 5 feet from the buildings shall be excavated to the lines and grades shown on the drawings or otherwise directed. Excavations shall be made wide enough to permit proper sheeting, bracing, and form work where necessary. All suitable excavated material shall be used for backfill as far as practicable. Trenches for water and sewer pipes shall be excavated generally to vertical lines 24 inches wider apart than the outside diameter of the pipe. The bottom of trenches shall be tamped hard and graded to secure the required fill. Bell holes shall be excavated so that the pipe will rest on solid ground for its entire length. Rock, where encountered, shall be excavated six inches below the bottom of the pipe, and before pipe is laid, the space between the bottom of pipe and the area shall be backfilled to the required grade with compacted pervious backfill as specified for compacted pervious backfill in Section 7 of these specifications. Sewer and water pipes shall be laid in separate trenches.

h. Filling Near Foundation Walls. - Where filling is done beside foundation walls, the fill shall be brought up essentially at the same heights on both sides at all times until the maximum level at the lower side is reached. Where a higher level of fill is required on one side of the foundation wall, the higher level must be properly compacted. Where a roller or tractor is used for compaction, the roller or tractor edge must not approach nearer than four feet from the face of the wall. The space so left shall be filled with compacted pervious backfill in accordance with requirements as stated in Section 7.

i. Backfilling. - After completion of foundation footings and walls and other construction below the elevation of the final grade, and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Prior to backfilling, the basement walls shall be dampproofed and inspected for approval of dampproofing. Material for backfilling shall consist of materials from required excavations or other materials approved by the Contracting Officer. Backfill shall be placed in accordance with the requirements stated in Section 32 for backfill for other work in the area. Each layer shall be compacted by machine tampers or by other suitable mechanical equipment to a density that will prevent excessive settlement or shrinkage. Precautions outlined above relative to filling near foundation walls, shall be observed while backfilling.

34-05. CONCRETE. - a. General. - All concrete work required for the building shall conform with the applicable requirements of Section 14, CONCRETE, with the following additional provisions:

(1) The maximum size aggregate shall not exceed 3/4-inch.

(2) Finish. - Where no special finish is required, the exposed concrete surfaces shall have all fine and rough edges removed, holes remaining from the bolts or rods and slight honeycomb and minor defects patched with mortar composed of 1 part cement to 2 parts sand. Steps and platforms shall be cast with the slab with risers and treads of uniform height and width. Exterior concrete treads shall slope 1/8-inch to the front and shall be left with a wood float finish. Concrete walks, aprons, and platforms shall be left with a wood float finish and scored as directed.

(3) Expansion Joints. - Expansion joints shall be constructed as indicated on the drawings and as approved. In no case shall the reinforcement, corner protection angles, or other fixed metal items, embedded in or bonded into concrete, be run continuous through an expansion joint.

(a) Joints between slabs on earth and vertical surfaces where indicated shall be of premolded expansion-joint filler strips conforming to Federal Specification HH-F-341a. Unless otherwise noted or specified, such joints shall be 1/2-inch thick and the full depth of slab.

(b) Joints with Compound. - Where joints are indicated to receive joint compound, the premolded expansion-joint filler strips, or other approved premolded strip material, shall be installed at the proper level below the finished floor with a slightly tapered, dressed-and-oiled, wood strip temporarily secured to the top thereof. The wood strip shall be of sufficient depth to form a groove not less than 1 inch deep. After the concrete has set, the wood strip shall be removed and the groove shall be filled with a light-colored calking compound or with compound for poured application. Joint grooves shall be filled approximately flush, so as to be slightly concave after drying.

(c) Finish at Joints. - Edges of cement floors or concrete slabs along expansion joints shall be neatly finished with a slightly rounded edging tool.

b. Splash Blocks. - Precast concrete splash blocks shall be provided at the outlet of downspouts, as shown, and shall be evenly bedded and set to slope from the building walls with discharge point approximately one inch above finish grade.

c. Concrete Stairs and Platforms. - Concrete stairs and platforms shall be given a wood float finish.

d. Slab on Grade. - The subgrade shall be brought to an even plane and compacted solid. Sand and gravel fill shall be deposited to the indicated thickness, and compacted and graded reasonably level. The fill shall be covered with vapor barrier. Concrete shall be deposited to the required thickness, and finished as specified.

(1) Vapor barrier shall be carefully installed to avoid puncture or tear. Punctures and tears occurring during subsequent operations shall be patched. Edges shall be lapped not less than 4 inches and end joints shall be lapped not less than 6 inches. Patches and lapped joints shall be sealed with a pressure-sensitive adhesive or pressure-sensitive tape not less than 2 inches wide. Adhesive or tape shall be compatible with the membrane, and as recommended by the manufacturer of the membrane. Vapor barrier shall be fungi-resistant when tested by the method set forth in Federal Specification L-S-137 and shall have a vapor permeance rating not exceeding 0.5 perm. as determined by method set forth in ASTM E-96, procedure E. Vapor barrier shall be asphalt-saturated waterproof reinforced kraft paper, clear polyethylene sheeting 0.006 inch thick, polyethylene-coated asphalt-saturated reinforced kraft paper, two layers of 30-pound asphalt-saturated felt solid-mopped with hot bitumen, or other similar material meeting above requirements for fungi-resistance and vapor permeance.

e. Polyethylene Protective Sheeting. - The polyethylene sheeting at exterior entrance stairs at the Operators' Quarters shall be cemented to the wood sheathing and conctete foundation wall in accordance with the manufacturer's instructions. Sheeting shall conform to vapor barrier material specified above. Cement shall be standard commercial product as recommended by the manufacturer of the polyethylene sheeting.

34-06. DAMPPROOFING. - a. Damproofing shall not be applied when the temperature is below 40 degrees F. and falling. The work shall be done by workmen experienced in the application of dampproofing, and the contractor shall coordinate dampproofing operations with other phases of the work to prevent staining or damaging finished work. The contractor shall repair or replace damaged finished work to the satisfaction of the Contracting Officer and without additional cost to the Government. Dampproofing may be either hot or cold application types, at option of the contractor.

b. Dampproofing shall be applied to the exterior surfaces of walls enclosing excavated basement spaces including basement stair walls for the Operators' Quarters, and shall extend from the bottom of foundation wall to within 4 inches of the finished grade.

c. Materials shall be delivered in sealed containers bearing the manufacturer's original labels. The following materials shall conform to the respective specifications designated below:

(1) Asphalt. - Federal Specification SS-A-666, type III.

(2) Asphalt Primer. - Federal Specification SS-A-701.

(3) Coal-tar Pitch. - Federal Specification R-P-381, type II.

(4) Creosote Oil. - Federal Specification TT-C-655.

(5) Fibrous Asphalt. - Shall conform to the requirements of Federal Specification SS-R-451, except that it shall contain not less than 12 percent of asbestos fiber.

d. Samples. - Before delivery of any material to the site, the following samples shall be submitted to the Contracting Officer for testing and approval:

Asphalt - 5 pounds
Asphalt Primer - 1 quart
Coal-tar Pitch - 5 pounds
Creosote Oil - 1 quart
Fibrous Asphalt - 1 quart

e. Surfaces to receive dampproofing shall be smooth, clean, and dry. Holes, joints and cracks shall be pointed flush with mortar and high spots ground level with the surrounding surface. Before dampproofing, surfaces shall be swept clean of all foreign matter and shall be inspected and approved.

f. Hot-Application Type. - Exterior surfaces to be dampproofed shall be given either a priming coat of creosote oil and two mop coats of hot coal-tar pitch or a priming coat of asphalt primer and two mop coats of hot asphalt. The mop coats shall be applied uniformly, using not less than 25 pounds per 100 square feet per coat. Pitch or asphalt shall be heated to flow freely but not to more than 375 degrees F. for coal-tar pitch and 400 degrees F. for asphalt. The finished surface shall be smooth, lustrous, and impervious to moisture. Dull or porous spots shall be recoated.

g. Cold-Application Type. - Exterior surfaces to be dampproofed shall be given a priming coat of asphalt primer and a coat of fibrous asphalt applied uniformly, using not less than 30 pounds per 100 square feet, in such manner as to cover all pores completely and to thoroughly bond with the wall surface.

h. Backfilling. - Backfilling shall not be started before dampproofing has been completed and approved.

34-07. MASONRY WORK. - a. Materials. - (1) Brick. - Brick shall be whole, sound, straight, hard, uniform in structure, with true even faces and sharp corners and of uniform size. Brick shall be common clay or shale brick conforming to ASTM Standard C 62, except that brick for exterior facing, including planter and stairs, shall conform to ASTM Standard C 216, Type FBS, selected for color range of approved sample. Color of brick for Operators' Quarters stairs shall match that of planter. All brick shall be Grade SW. Brick for interior faces of walls that are to be left exposed shall be reasonably smooth. Brick to be used in exterior work or in fireproof room, shall not be overburned, warped, or misshapen; and broken or chipped brick shall be set aside and used only in the backup and other unexposed parts of the work.

(2) Masonry Block. - Masonry block for Operators' Quarters planter wall below grade shall conform to ASTM Standard C 90, grade A.

(3) Flagstone. - Flagstone for Operators' Quarters stairs shall be 1" thick and of the color approved by the Contracting Officer and shall be set in mortar specified below.

(4) Flue Linings and Thimbles. - Flue linings and thimbles shall be terra cotta, free from blisters and warping, standard sizes, and of sound manufacture.

(5) Mortar. - Mortar for all work except joints in flue linings shall be composed of a 1:3 mix of masonry cement and sand, or of a 1:1:6 mix of portland cement, hydrated lime, and sand. Mortar for joints of flue linings shall be made with refractory cement - low temperature grade. Mortar materials and the method of mixing shall be subject to approval by the Contracting Officer.

b. Handling and Storage of Materials. - Brick shall be stored in an approved manner that will protect them from contact with soil and exposure to weather. Representative samples shall be taken from on-the-site stockpiles periodically for sampling. Care shall be taken in handling brick to avoid chipping and breakage. Storage piles, stacks, or bins shall be so located as to avoid being disturbed or shall be barricaded to protect these materials from damage by construction activities.

c. Erection. - (1) General. - Masonry shall not be erected when the ambient temperature is below 35° F. on a falling temperature except by written permission of the Contracting Officer. Masonry shall not be erected when, in the opinion of the Contracting Officer, the sun, heat, wind, or limitations of facilities furnished by the contractor prevent proper setting and curing of mortar joints or obtaining proper bond in the mortar. No frozen work shall be built upon. No brick or other units having a film of water or frost on their surface shall be laid on the walls. Clay brick having an initial rate of absorption in excess of 0.7 ounce per minute, determined in accordance with ASTM Standard C 67, shall be suitably wetted before laying. Corners and reveals shall be plumb and true. Structural bond shall extend not less than 4 inches into the backup unit masonry. Courses shall be so spaced that backing masonry will level off flush with the face work at all bonding courses and at joints where metal ties are used in lieu of masonry bond. Chases and raked-out joints shall be kept free from mortar or other debris. Spaces around metal door frames and other built-in items shall be solidly filled with mortar. Anchors, wall plugs, accessories and other items required to be built-in with masonry shall be built-in as the masonry work progresses.

(2) Brick. - Brick shall be damp when laid. Brick shall be shoved into place, not laid, in a full bed of unfurrowed mortar. All horizontal and vertical joints shall be completely filled with mortar when and as laid. Vertical joints shall be all of the same width except for inconspicuous variations required to maintain the bond and as noted on drawings.

(3) Chimney. - Chimney shall be built of brick lined with terra cotta flue lining of the sizes shown on the drawings and extending from one foot below the smoke inlet the full height of the flue and a distance of not less than one inch above the chimney cap of the Utility Buildings and one inch above concrete wash of the Operators' Quarters chimney. Mortar for joints of flue lining shall be made with refractory cement - low temperature grade, and struck smooth inside. The space between the lining and the masonry shall be filled solidly with mortar. Linings shall be built-in as the work progresses.

(4) Joints. - Exposed face of brickwork masonry unit walls shall be laid with joints concave. Unless otherwise indicated on the drawings or specified, mortar joints shall be not over 3/8-inch wide. All joints shall be formed with suitable tools. Joints shall be tooled in such manner as to squeeze the mortar back into the joints. No tooling shall be done until after the mortar has taken its initial set.

d. Pointing. - At completion of the work, all holes in joints of exposed masonry surfaces shall be pointed by completely filling with mortar of color to match the adjacent work.

e. Cutting and Patching. - Cutting and patching of brick masonry, as required to accommodate the work of others, shall be performed by masonry mechanics.

f. Unfinished Work. - Unfinished brick work shall be stepped back for joining with new work; toothing may be resorted to only when specifically approved by the Contracting Officer. Before new work is started, all loose mortar shall be removed and the exposed joint thoroughly wetted not less than 12 hours before laying new work.

g. Protection of Finished Work. - Surfaces of masonry not being worked on shall be properly protected at all times during the construction operation. The tops of exposed masonry walls and similar surfaces shall be covered with a strong waterproof membrane well secured in place when the work is stopped at the end of the day, or otherwise interrupted, or when rain or snow is imminent.

h. Calking. - Calking compound shall conform to Federal Specification TT-C-598 for gun application. Calking shall be installed where indicated or required. In addition to applying sealer, a coating of the sealer shall be applied to the surface of the calking compound prior to finish painting.

i. Pointing and Cleaning. - At completion of the work, holes in joints of exposed exterior masonry surfaces shall be filled with mortar and suitably tooled. After pointing has set and hardened, exposed masonry surfaces shall be cleaned with stiff fiber brushes, leaving the masonry clean, free of mortar daubs, and with tight mortar joints throughout. Immediately after cleaning, the masonry surfaces shall be thoroughly rinsed down with clean water.

34-08. SHEET METAL WORK AND MISCELLANEOUS METALS. - All structural steel and miscellaneous metals shall conform to the applicable requirements of Section 30, METAL, MISCELLANEOUS MATERIALS AND STANDARD ARTICLES, with the following additions:

a. Materials. - (1) Anchor bolts for anchoring the sills to the foundation walls shall be 1/2-inch diameter, 12 inches long, spaced on four foot centers, unless otherwise indicated on the drawings. The projecting portion shall be given a coat of red lead.

(2) Nails. - Nails for sheet metal work shall conform to the requirements of Federal Specification FF-N-101 for "Nails, Spikes, Staples and Tacks" and shall be not less than 0.109-inch diameter. Nails shall be of the large-head type and shall be of sufficient length to firmly secure the materials in place but not so long as to penetrate finished surfaces of sheathing at eaves. Non-ferrous nails shall be hard copper or copper alloy. Ferrous nails shall be hot-dip galvanized steel.

(3) Insect Screen Cloth. - Insect screen cloth shall conform to the requirements of Federal Specification RR-S-141a, for "Screening, Wire, Insect", Type II, and shall be 18 x 18-mesh.

(4) Screws. - Screws for sheet metal work shall conform to the requirements of Federal Specification FF-S-111a, for "Screws, Wood, Slotted-Head" and shall be of the type required to properly secure the wood. Non-ferrous screws shall be hard copper or copper alloy; ferrous screws shall be of steel, galvanized.

(5) Solder. - Solder shall conform to the requirements of Federal Specification QQ-S-571b, for "Solder (Tin, Tin-lead and Lead-Silver)", Composition 50 sn. Flux shall be rosin except where prohibited by unusual conditions of application, in which event soldering flux paste conforming to the requirements of Federal Specification O-F-50c, for "Flux, Soldering; Paste" or muriatic acid properly killed with zinc may be used.

b. Soldering and Seaming. - (1) Soldering. - All edges of uncoated sheet metal to be soldered shall be pretinned before soldering is begun. Soldering shall be done slowly with well-heated copper so as to thoroughly heat the seam and completely sweat the solder through the full width of the seam. Ample solder shall be used and the seam shall show not less than one full inch of evenly flowed solder.

(2) Seams. - (a) Flat Lock Seams. - Flat lock seams shall finish not less than 3/4-inch wide.

(b) Soldered Lap Seams. - Soldered lap seams shall finish not less than one inch wide.

(c) All Seams. - All seams shall be made in the direction of the flow.

c. Downspouts and Flashings. - (1) Downspouts. - Downspouts shall be of 16 ounce copper of the design and sizes indicated. Downspouts shall be provided in one length, shall be set plumb and clear of the wall by straps, not less than 1/8-inch thick by 1-1/2 inches wide, soldered to the downspout and firmly secured to supporting construction with brass screws. Straps shall be placed at top and bottom of downspouts. Elbow offsets shall be provided as indicated or required. Wire basket strainers of 14 gage copper wire shall be set in loosely in all gutter openings into downspouts.

(2) Flashings. - Flashings shall be installed at all intersections of roofs with vertical surfaces, at all projections through roofs except at plumbing pipe vents, and elsewhere as shown on the drawings or required, to provide watertight protection. Exposed edges of all flashings shall be folded back 1/2-inch to provide stiffness. All flashings shall be of 16-ounce copper unless otherwise specified. Except as otherwise specified or indicated on the drawings, cap flashings shall be provided over all base flashings.

(a) Base Flashings. - Base flashings shall be constructed of 20-ounce copper and shall extend up vertical surfaces not less than 8 inches and out on the roof, or horizontal surface, not less than 4 inches. On sloping roofs they shall lap lengthwise not less than 3 inches. Installation of base flashings for shingle roofing shall be coordinated with roofing work. The edges of base flashings on wood roofs shall be held in place on the roof side, by copper nails spaced 3 inches on centers.

(b) Cap Flashings. - Cap flashings shall be of 16 ounce copper. Cap flashings shall turn down over base flashings not less than 4 inches.

Cap flashings in masonry shall extend into the masonry not less than 3-1/2-inches and shall terminate with a 1/2-inch folded edge. The cap flashing shall be formed to provide spring action against the base flashing.

(c) Stepped Flashing. - Stepped flashing, occurring where the sloping surfaces intersect with vertical masonry surfaces, shall be stepped up the slope in sections of the length indicated on the drawings or required. The stepped flashing at vertical joints between the sections shall be lapped not less than 3 inches. Where sides of asphalt shingle roofing abut vertical surfaces, the base flashings shall be woven into the courses. Joints between edges of shingles and flashings shall be filled with plastic cement.

(d) Wall Flashing. - Wall flashing shall be installed where shown on the drawings. Flashings in walls, for such items as sills and heads of openings, shall be of 16 ounce copper and shall conform to the details shown on the drawings. Flashing at openings shall extend not less than 4 inches beyond the jambs of the opening. Wall flashings shall be installed, as required, to provide watertight construction.

(e) Metal Rain Diverter. - Metal rain diverter shall be of size and type as approved, shall be 16 ounce copper, and shall be installed in plastic cement over the shingles with suitable nails.

(f) Metal Lining for Planter. - Metal lining for planter in living room of Operators' Quarters shall be fabricated of 20 ounce copper and installed to provide a completely waterproof lining.

d. Metal Clad Door and Frame. - (1) Door. - Door shall be constructed of cores consisting of 3 layers of 7/8-inch thick selected, kiln-dried tongue-and-grooved, white or sugar pine, with each ply lined with asbestos paper. Stiles and rails shall be of solid stock to the full thickness of the door and of width shown on the drawings. The plies shall be laid at right angles to each other and clinch-nailed together. Sheet metal covering shall be stretcher-leveled, No. 28 gate steel or ingot iron and shall be tightly rolled or drawn on the surfaces without buckle, and in a manner that will insure permanent contact with the cores. All edges shall be sharp, straight and true. All joints or seams shall be soldered or welded, and ground smooth, except that at the edges of the doors the covering on both faces may lap each other with a heavy band set in a groove and fastened with screws, 4 inches on centers. Nails shall be zinc-coated and shall not be left exposed. All surfaces shall be primed with one shop coat of red-lead paint. All hardware for the metal-covered door shall be shop-installed. The hardware to be furnished shall conform to the requirements of a Class A door and shall include an automatically closing device and a latch arranged for padlocking. Installation including hardware and operational characteristics shall be in accordance with National Fire Protection Association Pamphlet No. 80 (current issue).

(2) Frame. - Frame for door shall be structural steel channel of the size indicated and notched for hardware. Stop shall be of structural steel bar stock welded to channel. Frame shall be provided with three anchors to each jamb. Reinforcement for hardware shall be welded to the web.

e. Metal Ventilator. - A metal ventilator with metal base, damper and fusible link shall be installed in the fireproof room of the utility building at the ceiling and extending through the roof.

f. Wire Grille. - Fabric for wire grille shall be woven of high carbon or manganese steel conforming to Federal Specification QQ-W-461b for "Wire, Steel (carbon,) Bare and Coated", grades FS 1035 and FS 1045. Wire shall be 10-gage, woven into 1-1/2-inch diamond mesh.

g. Miscellaneous Sheet Metalwork. - Sheet metal items not covered elsewhere in this section shall be as indicated on the drawings and as required to provide a watertight installation. Formed sheet metal for metal-covered work shall accurately reproduce the detail and design shown, and profiles and intersections shall be sharp, even, and true. Joints shall be locked or lapped, and soldered, as applicable. Reinforcements shall be provided as required.

h. Weatherstripping. - Materials in connection with weatherstripping shall be No. 9 gage standard sheet (not ribbon) zinc, cut across the grain. Bronze where used shall be not less than 32 B&S gage, pressure rolled for resiliency to a hardness especially suited for the purpose intended. Weatherstripping shall not react against type of threshold furnished.

i. Aluminum Ladder. - The contractor shall furnish a 26-foot aluminum extension ladder in utility building and shall install metal hangers therefor where directed. The ladder shall be similar and approved equal to "Duraladd" aluminum ladder manufactured by F. B. Jones Manufacturing Co. (Factory Branch), Somerville 44, Mass., and shall be equipped with safety shoes.

j. Metal Combination Storm and Screen Doors. - The contractor shall furnish and install aluminum combination doors complete with frames with interchangeable screen and glazed panels for the exterior door to office of the Utility Building, and for front and rear entrances of Operators' Quarters. Metal storm doors shall be of approved design and manufacture. They shall be fabricated completely by extruded heat-hardened and anodized aluminum sections and panels. Doors shall be 1-inch thick. All corners shall be neatly mitered and held together with heavy duty die cast non-ferrous metal inserted or other approved method. All other joints and connections shall be secured to give a permanent and rigid joint or connections. Screens shall be fabricated of extruded sections and screen cloth shall be aluminum 18 x 18-mesh. Frames shall be of a type that permits rescreening. Vinyl strip shall be placed at bottom. Storm glass section shall consist of an extruded frame and double strength glass set in neoprene. Doors shall be hung on piano hinge full height of door conforming to requirements of door manufacturer. Doors shall have hand latch and keeper on jamb. Doors shall be fitted and hung and demonstrated to operate perfectly. Door closers shall conform to Fed. Spec. FF-H-121c and shall be Type 3015. Doors shall be installed within their own aluminum frame securely fastened to door jambs and heads.

k. Mirrors. - Plate glass mirrors shall be furnished and installed over each lavatory in the Utility Buildings. Bottom of mirrors shall be 4'6" from floor, unless otherwise directed. Mirrors shall conform to Federal Specification DD-M-411, Grade I (copper-backed) Class E, modified for size 14" x 24".

l. Cabinet for Paper Towels. - One cabinet for paper towels shall be installed in each toilet room of the Utility Building, where directed. Cabinets shall conform to Federal Specification WW-P-541b, type 445.

m. Metal Toilet Enclosures and Partitions. - Flush type metal toilet enclosures and partitions and screen and urinal partitions shall be furnished and installed in the toilet rooms of the Utility Building where indicated. The work shall include all fastenings, fittings and hardware for a complete and satisfactory installation. The enclosures and partitions shall be the good quality product of a reputable manufacturer and shall be approved prior to delivery to the site. All sheet metal shall be cold-rolled, galvanized, bonderized, stretcher-leveled, furniture steel stock. Enclosure doors shall swing in and each enclosure shall be fitted with hinges, a throw latch, a combination hook and bumper, and a toilet paper holder. Toilet paper holders shall be roll type, standard with the manufacturer. All surfaces shall be cleaned and factory finished with baked-on primer and finish coats, color to be selected from manufacturer's standard colors.

n. Metal Louvers. - Metal louvers shall be fabricated of 20 gage aluminum. Louver frames shall be constructed as to provide a watertight seal between frame and wall. Louvers shall be provided with non-ferrous type insect screen, 18 x 18-mesh.

o. Metal Lavatory Shelves. - A metal shelf shall be provided over each lavatory in the toilet rooms of the Utility Building. Shelves shall conform to Federal Specification WW-P-541b, Type 426M, or approved equal. Brackets shall be secured with countersunk, oval head, tamper-proof chrome plated screws. In masonry construction, screws shall be set in fiber anchor plugs. Shelves shall be set 3'-11" from floor unless otherwise directed.

p. Bulkhead. - The metal bulkhead door for entrance to basement of Operators' Quarters shall be similar and approved equal to Bilco steel basement door, Size C. Door shall be furnished with manufacturer's baked on prime coat.

q. Medicine Cabinet. - One recessed medicine cabinet with mirror door and fluorescent lights shall be provided over lavatory in the bathroom of the Operators' Quarters. Cabinet shall require wall opening of approximately 16 inches by 22 inches. The cabinet shall be similar and approved equal to Miami Carey Model No. 650-30. Mirror shall be 18" x 24".

r. Chimney Cleanout Doors. - Chimney cleanout door of approved size shall be provided and shall be cast iron conforming to Federal Specification QQ-I-652, Class 25 or 30, complete with frames, and unless otherwise indicated sized to match flue. Frame shall have anchors and a continuous flange for fastening into masonry. Door shall be hinged and shall have fastening device. Shop drawings shall be submitted.

s. Concrete-Filled Pipe Columns. - Pipe for concrete-filled steel pipe columns shall be 3-1/2-inch diameter, extra strong weight steel pipe conforming to the requirements of ASTM A53-58aT, grade B, mill tested steel pipe cut and slotted to receive connections with a minimum yield point of 35,000 p.s.i. The pipe shall be furnished filled with concrete. Pipe columns shall be provided with all required caps and bases. Pipe columns, caps and bases shall be erected in accordance with the details shown on the drawings. Shop drawings shall be submitted.

t. Metal Thresholds. - (1) Operators' Quarters. - Metal thresholds shall be installed for all exterior doors to Operators' Quarters and where shown on drawings except basement door. They shall be non-ferrous interlocking type size as indicated and shall accommodate bottom hook strips furnished. Threshold shall be bedded in an approved mastic. All thresholds shall extend full distance between door jambs. Ends of thresholds shall be furnished with necessary cutouts to fit door jambs. Secure thresholds in place with 1/4-inch diameter countersunk non-ferrous screws one at each end intermediately spaced not over 12-inches on centers.

(2) Utility Building. - The thresholds of the exterior doors of the Utility Building where indicated on door schedule shall be the interlocking weatherstrip type, 5-1/2" x 5/8", fabricated from nonferrous metal with a non-slip top surface and shall be bedded in calking compound and anchored to the concrete by means of bolts set in expansion sleeves.

u. Clothes Poles. - The contractor shall provide in all the coat and clothes closets a 3/4-inch inside diameter, standard weight, galvanized steel pipe conforming to the requirements of Federal Specification WW-P-406. The pipe except as otherwise required, shall be attached to the wall at each end with a flanged fitting and screws. In addition, the pipe shall be supported from the center with a metal hanger secured to the closet shelf. In closet where scuttle to attic space occurs, pole installation shall permit easy removal without use of tools.

v. Wrought Iron Hand Rails. - Exterior wrought iron hand rails for Operators' Quarters shall be of the sizes and types indicated on drawings. Wrought iron shall conform to requirements of Federal Specification QQ-I-686, of the grade best suited. Hand rails shall be installed in a sturdy and durable manner as approved by the Contracting Officer. Shop drawings shall be submitted.

w. Extension Traverse Rods. - Provide one extension traverse rod, length adjustable from 12 feet to 16 feet, and install in living room of Operators' Quarters so as to span the three awning combination windows. Provide two extension traverse rods, length adjustable from 50 inches to 86 inches, and install so as to span each pair of awning windows in bedrooms 2 and 3 of Operators' Quarters. All traverse rods shall be manufacturer's standard residential type and similar and approved equal to Kirsch residential type and shall have center close two way operation, adjustable projections from 2-1/2-inches to 3-1/2-inches minimum, snap on end brackets, ball bearing tension pulley suitable for floor mounting, continuous braided cotton fiberglass core pulley cord, and shall be galvanized bonderized and finished with white or ivory baked enamel. The large traverse rod shall have at least two intermediate supports and a minimum of 56 nylon carriers. The smaller rod shall have at least 20 nylon carriers. Fastenings for attachment of brackets shall be plated steel screws of proper length and type. Toggle bolts shall be used for mounting.

x. Heater Room Door (Interior door). - The interior door and frame for the heater room in the Utility Building shall be either hollow metal or kalamein type for a class B door. Label will not be required; however, certificate of compliance shall be submitted.

y. Robe Hook. - Robe hook conforming to Federal Specification WW-P-00535 figure 3, shall be installed on bathroom door in Operators' Quarters and mounted 66 inches above floor. Hook shall be installed on lockplate.

z. Basement Windows. - Basement windows of the Operators' Quarters shall conform to Steel Window Institute Recommended Standards for Steel Windows, basement type. Ventilators shall be hinged at bottom to project in and shall be provided with outside insect screening of nonferrous 18 x 18-mesh type. Standard hardware shall also be furnished.

34-09. CARPENTRY. - a. Lumber and Woodwork. - Lumber shall conform to Federal Specification MM-L-736 for "Lumber and Timber, Hardwood", and MM-L-751c for "Lumber and Timber, Softwood". A certificate of conformance with Federal Specifications will be accepted in lieu of inspection requirements. At the contractor's option, lumber for the various uses shall be one of the species listed for the purpose and of the grade indicated.

(1) Rough Carpentry:

	SPECIES AND GRADE		
	Douglas Fir Sitka Spruce Western Red Cedar	Northern White Pine Eastern Spruce	White Fir
Column and Posts, Roof Trusses	Any stress-graded species -1,450 f., 1,075 c., 1,540,000 E. (Unless otherwise indicated on the drawings).		
Rafters, Sills, Joists, Headers and Stair Carriages	Any stress-graded species. - 1100 f., 850 c., 1,320,000 E. (Unless otherwise indicated on the drawings).		
Studs, Plates, Caps, Nailers	Standard	No. 2	No. 2
Subflooring and Roof Sheathing	Standard	No. 3 Boards	No. 3
Wall Sheathing, Bridging Ridge Boards, Bracing, and Furring	Standard	No. 3 Boards	No. 3
Subfloor - Bathroom	Exterior type, Grade C-C (Plugged Ext)		

(2) Exterior Finished Carpentry:

	SPECIES AND GRADE		
	Douglas Fir Sitka Sprice Western Red Cedar	Northern White Pine Eastern Spruce	Redwood
Cornices	C and better	C Select	
Trim and Corner Boards	C and better	C Select	
Window and Door Frames	Practically clear material without obvious defects. Window jambs, parting strips, and sills of Douglas fir, and sills of Sitka spruce shall be VG or EG. Door frames shall be of second grade for paint finish.	Practically clear material without obvious defects. Window jambs, parting strips, and sills of Douglas fir and sills of Sitka spruce shall be VG or EG. Door frames shall be of second grade for paint finish.	
Gutters	Best Grade		

(3) Interior Finished Carpentry: SPECIES AND GRADE

	Douglas Fir Sitka Spruce Western Red Cedar	Northern White Pine Redwood Eastern Spruce
Trim	Highest grade for natural finish; second grade for paint finish. Wood for natural finish shall be uniform in color.	
Moldings	Standard Moldings	B and better Moldings
Shelving	No. 2 Boards	No. 1 Boards
Wainscot (146T & G)	No. 2 Stock	No. 1 Stock
Stair Treads and Risers	Construction	No. 1

(4) Flooring (Operators' Quarters):

	Oak Red or White	Beech, Birch Maple, Pecan
Living Room, Dining Room and Halls, including hall closet	Select (Plain Sawed)	Second
Bedrooms and Bedroom closets	No. 1 (Plain Sawed)	Second
Thresholds (front door)	Select grade (CS 56-49) Oak, Red or White to Match Flooring	
Thresholds (rear door)	Longleaf Southern Pine, Grade No. 1	
Kitchen (under linoleum)	Douglas Fir Commercial Standard CS 45-55, Ext. Type, Grade C-C (Plugged) Ext.	

b. Other Materials. - (1) Tempered Pressed Wood Fiberboard. - Tempered pressed wood fiberboards shall conform to the requirements of Federal Specification LLL-H-35 for "Hardboard, Fibrous-Felted (Fiberboard)", 3/16-inch thick, Type II.

(2) Gypsum Wallboard. - Gypsum wallboard shall conform to Fed. Spec. SS-W-51a, 1/2-inch thick, unless otherwise indicated or specified.

(3) Batt- and Blanket-Type Insulation. - Federal Specification HH-I-515, Class A, treated for fire-resistance rating of slow burning or better, with vapor barrier membrane and edges suitable for nailing insulation between supporting members; HH-I-521c, Type I, Class B or C.

(4) Laminated Aluminum Foil Insulation shall be an open mesh glass fiber reinforcing mesh on flame-proofed paper.

(5) Roofing Shingles. - Roofing shingles shall conform to Federal Specification SS-R-521 for "Roofing and Shingles; Asphalt, Prepared, Mineral Surfaces", Type II.

(6) Waterproof Sheathing Paper. - Waterproof sheathing paper shall conform to Federal Specification UU-P-147b for "Paper; Building, Waterproof", Type I, Class B.

(7) Lag Screws. - Lag screws shall conform to Federal Specification FF-B-561a for "Bolts; Lag".

(8) Bolts, Nuts and Studs. - Bolts, nuts and studs shall conform to Federal Specification FF-B-571a for "Bolts; Nuts; Studs; and Tap Rivets (and Material for same)".

(9) Nails. - Nails shall conform to Federal Specification FF-N-105 for "Nails; Wire and Staples".

(10) Screws. - Screws shall conform to Federal Specification FF-S-111a, for "Screws; Wood, Slotted-Head".

(11) Clamps, etc. - Clamps, expansion bolts, expansion screws, washers and anchors shall be of steel or iron and of standard type and manufacture as approved.

(12) Asphalt Saturated Felt. - Asphalt saturated felt shall conform to Federal Specification HH-F-191a for "Felt; Asphalt-saturated (for) Flashings, Roofing, and Waterproofing".

(13) Glass. - Glass shall conform to Federal Specification DD-G-451a for "Glass, Flat and Corrugated for Glazing, Mirrors and Other Uses".

(14) Calking Compound. - Calking compound shall conform to the requirements of Federal Specification TT-C-598 for "Compound, Calking; Plastic (for) Masonry and Other Structures".

(15) Plywood for building exterior including soffits shall be exterior type conforming to CS 45-55, Grade A-C for natural finish and Grade B-C for painted surfaces, thickness as indicated except that grooved plywood siding for Operators' Quarters shall be "Texture III" as specified by the Douglas Fir Plywood Association.

c. Framing and Boarding. - (1) Lumber and Other Rough Work. - Lumber and other rough work shall be properly framed, closely fitted, accurately set to the required lines, and rigidly secured in place. No shims will be allowed on wood or metal bearings. Studs and joists shall be sized to give true surfaces for finish. Framing shall be kept at least 2 inches away from the chimney. Members shall be framed to allow for passage of pipes to avoid cutting of structural members. No members shall be cut, notched, or bored for the passage of such pipes without prior approval. Wall plates shall be built up of two thicknesses of lumber with joints broken. All corners shall be wind braced. Ridges shall be straight and true intersections of the roof planes. Rafters on plates and ridges shall be framed with close joints. Blocking not less than 2 x 4-inch stock or size of framing member shall be placed between rafters, joints, and studs where necessary, indicated, or directed, to form nailings for roof and wall sheathing, and subflooring. Ceiling joists shall be lapped and spiked together at bearings and spiked to studs where same occur. Openings shall be framed with headers and trimmers. Headers carrying more than one tail-joist shall be tripled. Furring and strapping shall be 1" x 3" strips spaced as indicated on the drawings and installed transversely to ceiling joists and walls, and shall be provided around all openings, angles, corners and elsewhere as required. Bridging shall be provided where shown.

(2) Trussed Rafters. - The trussed rafters for the Utility Buildings shall be fastened with timber connectors conforming to the following requirements: Split rings shall be manufactured from hot rolled S.A.E.-1010 carbon steel, 2-1/2 inches in diameter. Each ring shall form a closed true circle with an outside cylindrical surface parallel to its axis. Split rings shall be cut through in one place in its circumference to form a tongue and slot. The dimension of the rings shall be as follows:

Inside diameter when closed	2.50"
Depth of ring	3/4"
Thickness of metal with inside surface beveled edge	0.163"
Beveled center	0.163"

Bolts shall be machine bolts 1/2-inch in diameter. Plate washers 2" x 2" x 1/8" shall be used on both sides of the joint. The groove for the ring shall have an inside diameter of 2/56 inches, a depth of 0.37 inch and a width of 0.18 inch.

(3) Wall and Roof Sheathing. - Wall and roof sheathing shall be dressed and matched and laid in level courses well driven up, at every bearing. Joints shall be over supports with not less than two boards between joints on same support. Roof surfaces of every kind shall conform to roof lines and slopes shown on the drawings or required. Waterproof sheathing paper shall be installed over wall sheathing and wood subfloors.

(4) Studs. - Studs shall be 2" x 4", spaced 16 inches on centers, unless otherwise shown. Plates and sills resting on concrete walls shall be anchored in place with 1/2-inch bolts. Studs shall be built up double round openings and trussed over all doors and windows. Corners shall be thoroughly spiked together and made solid. All bearing partitions shall be provided with top and bottom plates. Partitions and walls shall have at least one row of horizontal bridging full width of studding, cut and securely nailed unless additional bridging is indicated. Studs shall be framed as shown or required for the proper installation of trim, plumbing, and other work to be concealed. Nailing strips shall be cut as required for the support of fixtures of all kinds. Partitions carrying soil pipe shall be furred out for same.

(5) The contractor shall provide three stringers of 2-inch stock, cut to exact shapes required to receive finish treads and risers for basement stairs. Risers shall be of uniform height and treads of uniform width. All trimmers blocking and other framing shown or necessary to provide support for the finish treads and risers shall be installed. Finish stairs shall have 7/8-inch treads with nosings, and 7/8-inch risers nailed direct to rough stringers.

(6) Subflooring shall be of 1 x 6-inch, or 1 x 8-inch dressed and square-edged material. Subflooring in bathroom shall be laid diagonally. Butt joints shall be staggered and over supports, with ends cut parallel to joists. Two nails, not smaller than tenpenny, shall be used at each bearing. Boards shall be face-nailed with nail heads well set. Subflooring to receive nailed wood flooring shall be covered with rosin sized paper.

(7) Subflooring, minimum thickness 5/8-inch, shall be installed in bathroom with grain of face plies across the joists. End joints shall be butted over supports. Plywood shall be nailed 4-inches on centers along edges and ends and 6-inches on centers along all intermediate bearings using 1-3/4-inch annular or screw type nails.

(8) Underlayment for linoleum over wood subflooring shall be plywood. Underlayment shall be secured to the subfloor with 1-1/4-inch screw type or annular-ring-type nails, 1-3/8-inch cement-coated sinker nails, or 7/8-inch long, No. 18 gage etched or galvanized divergent point staples as recommended by the manufacturer of the staples. Plywood shall be not less than 3/8-inch thick, exterior type, grade C (Repaired)-C. Nails or staples shall be spaced 6-inches on centers at edges of panels and 8-inches on centers in both directions in the field of panel.

d. Insulation. - (1) Soundproof partitions shall have not less than 2-inches of blanket insulating material installed between the staggered studs where shown. The insulation shall be securely nailed to alternate studs. Elsewhere, insulation shall be installed as specified for thermal insulation.

(2) Thermal Insulation. - Thermal insulation shall be placed where shown on drawings, and to the indicated thicknesses, in accordance with the manufacturer's recommendations. Batts shall be placed between ceiling joists, unless otherwise indicated.

(3) Reflective Insulation. - Reflective insulation of the laminated aluminum foil open mesh glass fiber reinforcing mesh type on flame proofed paper shall be installed behind base board radiators.

e. Exterior Finish. - (1) All exterior finish shall be milled from materials specified and erected in strict conformity with details. The exposed surfaces of finish woodwork shall be smooth and ready to receive paint or other finish. All nailing shall be blind or face nailing as required with face nails set for putty-stopping. Cornice and other exterior trim and millwork shall be constructed so that water cannot pass through the joints. Molded work shall be coped at returns and interior angles and mitered at corners. Intersections of flat work shall be shouldered. Moldings shall be run to exact profiles shown on details. Rake mouldings shall be run to profile required to miter with horizontal moldings. Plywood shall be installed where indicated.

(2) Grooved plywood siding shall be equal to "Texture One-Eleven" as specified by the Douglas Fir Plywood Association and shall be installed according to the details shown on the drawings and as recommended by the above association.

(3) Wood shingles shall conform to Commercial Standard CS 31 and shall be of random width and 16 inches long. Shingles shall be applied single-coursed, and maximum weather exposures shall be 7-1/2-inches. Shingles shall be secured with corrosion resisting three penny nails, driven approximately one inch above the butt line of the next course to be applied and approximately 3/4-inch from each edge, with a third nail in the center of the shingle. Joints between shingles in adjacent courses shall be broken or kept out of vertical alignment at least 1-1/2-inches. The starting course at base of wall shall be doubled. All shingles shall be predipped as specified under PAINTING section.

f. Wood Louver Ventilators. - Wood louver ventilators shall be built as indicated on the drawings. Insect screens on frames and removable covers shall be provided in back of louvers.

g. Window Frames. - Window frames shall conform to the following requirements. (Shop drawings shall be submitted).

(1) Double-hung frames shall have 3/4-inch jambs, heads, and blind stops, 1/2- by 3/4-inch parting strips, 1-5/8-inch sills and 1-1/8-inch side and head casings. Jambs or heads shall be cut as required by the type of spring balances specified. Inside stops shall be secured with screws and adjusters. Sills shall be run with weather breaks on top and one or more grooves on bottom as shown. When staff beads are required, they shall be loosely attached.

(2) Awning Frames. - Awning frames shall have 1-3/8-inch jambs and heads and 1-5/8-inch sills. Sills shall be run with weather breaks on top and one or more grooves on bottom as shown. Frames shall be cut or worked as required to receive operating hardware. When staff beads are required they shall be loosly attached.

(3) Mullions. - Mullions shall be constructed to the size shown or required.

h. Sash. - Sash shall be of the type and design indicated. Nominal thickness of double-hung sash shall be 1-3/8-inches for Operators' Quarters and Garage and 1-3/4-inches for Utility Building, and all awnings, fixed and hopper sash shall be not less than 1-5/8-inches. Ponderosa Pine sash 1-3/8-inches and less in thickness shall conform to CS 163-59, and 1-3/4-inch-thick sash shall be equal in construction and quality. Sash of Douglas fir, cypress, or southern pine shall be of the same construction and quality as specified for Ponderosa Pine. Double-hung sash shall be check-rail type, shall be grooved for attachment of spring balances, and when over 3 feet 4 inches wide, bottom rail of upper sash shall be rabbeted the full length and reinforced with a zinc-coated steel angle not less than 1 inch by 1-1/2-inches in size. Awning type sash shall be furnished complete with all operating hardware and weatherstripping. Sash shall be fitted closely after frames are set, shall be made to work free and easy, and shall be well-balanced. All windows except those in basement and unheated spaces shall be weatherstripped in accordance with CS204-59 and CS 190-59 as applicable. Sash in toilet rooms in Utility Building shall be glazed with Type IIIc, rolled figured obscure glass, and all other sash except awning type windows of Operators' Quarters shall be glazed with Type II, B quality, double-strength, clean glass conforming to Federal Specification DD-G-451a for "Glass; Flat and Corrugated (for) Glazing, Mirrors and Other Uses". All glass shall be set in best quality putty. Glass for all awning combination and awning type windows in Operators' Quarters shall be double strength B quality, clear sheet glass and shall be of the multiple-pane insulating type consisting of two lights which are separated by dehydrated air spaces hermetically sealed.

i. Storm Sash. - Storm sash for double-hung windows shall be of the same construction as specified for window sash, except 1-1/8-inch thick. The sash shall be of the full height of the opening with the center horizontal division the same width as the check rail of the window sash and aligned with same. Storm sash shall be provided for all double-hung windows in the Operators' Quarters and for all double-hung windows in Utility Building except in heater room and dead storage space. Storm sash shall be provided for all awning type windows in the Utility Building, type as provided by the window manufacturer. Sash shall be glazed with Type II, double-strength, B quality glass.

j. Insect Screens. - (1) Insect screens (half screens) of 16-mesh non-ferrous screen cloth shall be provided for all double-hung windows in the Utility Building and in Operators' Quarters except for windows in dead storage and workshop areas. The window openings shall be provided with aluminum channel slides properly installed. Window screen frames shall be of 3/4-inch stock with top rails and stiles 1-1/2-inches wide and bottom rails 2 inches wide.

(2) Awning and hopper type windows shall be provided with metal framed screens as provided by window manufacturer.

k. Door Frames. - Exterior door frames shall be 1-3/4-inches thick, double-rabbeted from the solid for doors and combination metal storm and screen doors, unless otherwise shown. Interior door frames shall be 1-3/8-inch thick, full width of finished wall or partition and shall be double-rabbeted from the solid and secured with finish nails. Double wedge blocking shall be driven back of jambs at nailing points and at back of butts and lock strikes.

l. Doors. - (1) General. - Doors shall be of design and sizes indicated and shall be fabricated in accordance with the best practice of the trade, with all joints properly formed, tightly fitted and tenoned. Exterior doors shall be flush, paneled or glazed as shown, 1-3/4-inch thick. Glass shall be type II, double-strength, B quality. Louver shall be provided for door to men's toilet in Utility Building. All exterior doors, (except overhead doors, door to heater room in Utility Building, and garage swing door) shall be completely weather-stripped. Heater room door in Utility Building shall be weather-stripped at door bottom only. Strips shall be as wide as the door will allow and secured by nails spaced not more than 1-inch apart. Interior doors shall be 1-3/8-inch except as otherwise indicated. Door with wire-grille shall be constructed of 2 x 4's with joints half-lapped. Grille shall be fastened to door with staples on 6" centers and a 1" x 2" wood strap laid over and firmly nailed on 4" centers.

(2) Swing Doors. - Top and bottom edges of doors shall be given two coats of spar varnish at the factory before shipment. Exterior doors shall be fabricated with water-resistant adhesives.

(a) Exterior paneled doors shall be softwood doors. Panels may be solid or laminated; laminated panels shall be not less than 3-ply, and when raised, face veneers shall be of sufficient thickness to take the raising. Doors shall have solid stiles and rails. Softwood doors of Ponderosa Pine shall conform to CS 120-48, grade 2; of Douglas fir, Sitka spruce, or western hemlock shall conform to CS 73-61, grade B; of redwood, cypress, or southern pine shall be equal in construction and quality to the corresponding grades of CS 120-48 or CS 73-61.

(b) Exterior flush doors shall be softwood-veneered and shall have solid cores of the stile-and-rail type. Doors, when constructed without cross-banding, shall have sawn or sliced face veneers not less than 3/16-inch thick before sanding, and when cross-banded, combined thickness of cross-banding and face veneer on each face shall be not less than 3/16-inch before sanding. Otherwise, softwood-veneered doors of Ponderosa Pine shall conform to CS 120-48, grade 1; of Douglas fir, Sitka spruce, or western hemlock shall have vertical grain faces for paint finish and construction and quality shall be equal to those required by CS 91-41.

(c) Interior flush doors of Utility Building shall be softwood-veneered solid-core doors; Interior flush doors of Operators' Quarters shall be hardwood-veneered hollow-core doors.

1. Solid-core doors may have wood cores or composition cores at the option of the contractor.

(i) Wood-core doors may be of the vertical-block type or the stile-and-rail type at the option of the contractor. Softwood-veneered doors of Ponderosa Pine shall conform to CS 120-58, grade 1; of Douglas fir, Sitka spruce, or western hemlock shall have vertical-grain faces for paint finish and construction and quality shall be equal to those specified for pine doors.

(ii) Composition-core doors shall have a core composed of inert mineral substances which when processed shall weigh not more than 28 pounds per cubic foot and have a moisture content not in excess of 6 percent, and shall consist of three or more pieces securely bonded together and to the stiles and rails. Stiles and rails shall be of laminated hardwood and shall have a nominal width of 1-1/2-inches and 4-1/2-inches, respectively. One lock block not less than 4 inches wide shall be provided and its location suitably indicated. The core shall be sized to provide a suitable base for gluing. Cross-banding shall be not less than 1/16-inch thick, and face veneer shall be hardwood not less than 1/28-inch thick, each applied with waterproof glue.

2. Hollow-core doors shall conform to CS 171-58, grade "Good Grade". Type of core construction shall be at the option of the contractor.

(3) Overhead Door for Garage. - Door for garage shall be sectional overhead and of size as indicated on the drawings, and shall be constructed of 1-3/8-inch thick, mortised and tenoned, glued, steel doweled, stiles and rails with rebated weather joints throughout. Stiles shall be 3-1/2-inches wide at centers and 5-1/2-inches wide at ends. Center rails shall be 2-9/16" minimum, and top and bottom rails shall be 5-1/2-inches wide. Door shall be furnished with rubber weather-strip at bottom. Door panels shall be 1/4-inch thick exterior grade plywood. Provide fixed glazed openings in door as indicated on drawings, and glaze with double-strength, B quality, clear glass bedded in elastic glazing compound. Counter balancing hardware shall be torsion-spring type on cross header steel shaft. All metal parts such as tracks, guides, bracing and hardware shall be furnished with the door to complete the

installation. Tracks shall be 2-inch size and furnished for a 10-inch maximum head radius with adjustable jamb brackets on the verticals. All metal parts shall be galvanized steel. Door sections shall be hinged at rail center stile and end stile. Door shall be erected in accordance with manufacturer's instructions.

(4) Overhead Doors for Utility Building.- Overhead doors for Utility Building shall conform to the requirements for overhead garage door, except as follows:

(a) Doors shall be 1-3/4-inches thick.

(b) Doors shall be provided with left and right torsion springs.

(c) Doors shall be commercial and industrial type, as furnished by manufacturer, and shall not be residential type of door.

(5) Fittings, Hanging and Trimming. - The contractor shall set, fit, and hang all doors including combination storm and screen doors. Swing doors shall have 1/16-inch clearance at side and top and 3/16-inch clearance over thresholds at the bottom, and shall be hung and trimmed with hardware as specified. Doors in openings without thresholds shall have 3/8-inch clearance. Screens shall be fitted and made insect tight.

m. Blocking, Strapping and Furring. - Wood blocking, strapping, and furring shall be furnished as indicated or required for proper support or attachment of other items of work.

n. Interior Finish. - (1) Interior Finish. - Interior finish shall be manufactured of wood specified. All interior trim, including base board, chair rail, casings, window stools and aprons shall conform to the details shown. All interior trim to be set against the plaster and wallboard in the buildings shall be run with hollow backs. All joints shall be made in an approved manner to conceal shrinkage and shall be tight. Joints shall be secured with fine finishing nails and with screws where required. All nails shall be set for putty stopping. Wood finish shall be set straight plumb or level, in perfect alignment, and shall be closely fitted. Window and door trim shall be in single lengths. Moldings shall be mitered at exterior corners and coped at interior angles. Hook strips shall be provided for closet shelves. The work shall be installed as detailed and as indicated on the drawings. Bench shall be anchored to wall with two 3" x 3" clip angles on each rear leg.

(2) Walls, Ceilings, etc. - Walls, ceilings and all other areas where indicated shall be covered with gypsum board. Joints shall be reinforced, taped and concealed and all nail heads filled with three coats of joint material. Storage, handling, nailing, erection, corner treatment, taping of joints, nailing and concealing of all nailing

depressions shall be in accordance with manufacturer's instructions. All gypsum wallboard, except in Utility Building Heater Room, shall conform to subparagraph 34-09b(2). Gypsum wallboard for wall and ceiling finish in Heater Room shall be special fire-retardant type gypsum board not less than 5/8-inch thick and bearing Underwriters' Laboratories label for 1-hour rating. Where double layers are indicated, joints of face layer shall not occur on base layer.

(3) Pressed Wood Fiberboard. - Pressed wood fiberboard shall be installed as a wainscot as shown on the drawings using a combination nailing and adhesive method. The installation of pressed wood fiberboard shall be in accordance with manufacturer's recommendations. The board shall be conditioned as follows:

(a) Screen-Back Hardboard. - The contractor shall scrub cold water into the screen side of each panel with a stiff broom or brush until the color of the panel darkens. The panels shall be stacked screen sides together, covered with a tarpaulin or other covering and allowed to stand for 24 hours just prior to use.

(b) Smooth-Back Hardboard. - The contractor shall place a single thickness of newspaper over the entire intended back side of a panel and thoroughly wet the newspaper with cold water. Next, the panels shall be sandwiched in this manner. Finally, the stack shall be covered with a tarpaulin or other covering and allowed to stand for 24 hours just prior to use.

(4) Scuttles. - Scuttles shall be constructed as indicated.

(5) Floors. - Finished wood flooring shall be dressed and matched, laid with close joints on building paper, tightly driven up and blind-nailed with eight-penny cut steel or spiral or screw type flooring nails into each floor joist. Joints shall be alternated, so that there will be at least two boards between them. Flooring shall be machine-sanded, with hand scraping around edges or other surfaces not accessible by machine, and left in perfect condition for finishing. Floors shall be protected until the finish treatment has been applied.

o. Kitchen Cabinets and Counters. - Kitchen cabinets for Operators' Quarters shall conform to the details shown on the drawings, and shall be of stock patterns, accurately and neatly fitted and jointed. All exposed surfaces of cabinets and counters shall be of select grade birch lumber or birch-veneered plywood as indicated. Birch-veneered plywood shall be CS 35, type II, good grade for natural finish, thickness as indicated. Concealed and enclosed plywood shall be interior type, grade B-C, thickness as indicated, conforming to CS 45. Counters shall be provided with one sliding type cutting board and one cutlery drawer. Hardboard where required shall conform to the requirements specified hereinbefore. Counter tops and back splashes shall be covered with laminated plastic sheets conforming to Federal Specification L-P-00508a, style D, type I, grade HP, class 1, finish A, color as selected by the Contracting Officer. Metal trim shall be stainless steel or chromium plated. All hardware required for the cabinets shall be furnished and installed by the cabinet manufacturer and shall be the manufacturer's standard types as approved by the Contracting Officer.

p. Planter. - Planter in Living Room of Operators' Quarters shall conform to the details shown on the drawings. Birch trim and birch-veneered plywood shall conform to requirements specified above for kitchen cabinets and counters. Concealed plywood shall be exterior type, grade B-C, thickness as specified, conforming to CS 45.

q. Access Panel. - Access panel to bathtub plumbing shall have closure made of 1/2-inch thick, interior type, grade B-C plywood conforming to CS 45. The opening shall be framed to the required size and trimmed. Plywood shall be attached to the trim with suitable wood screws.

34-10. ASPHALT TILE. - a. General. - Asphalt tile shall be installed in the office of the Utility Building. Materials shall be stored at a minimum temperature of 75 degrees F. for at least 24 hours before installation. In the spaces where asphalt tile is being installed, a temperature of at least 75 degrees F. shall be maintained from 48 hours before installation until 48 hours after installation. Adequate ventilation shall be provided to take off moisture and volatile fumes. Unless otherwise specified, materials and methods used shall be in strict accordance with the recommendations of the manufacturer of the asphalt tile. Materials shall be delivered to the project site in the manufacturer's original unopened containers with the manufacturer's brand and name clearly marked thereon. Asphalt tile edging strips shall be provided when indicated.

b. Materials. - (1) Asphalt tile shall conform to Federal Specification SS-T-306b, shall be 9 inches square and 1/8-inch thick, and shall be selected from color group B.

(2) Primer shall be one of the following types, depending on which type cement is used.

(a) Emulsion-type primer consisting of water and emulsion-type cement conforming to Federal Specification SS-A-00138, class 1, mixed to the consistency of heavy paint.

(b) Cut-back-type primer composed of an asphaltic base reduced with a suitable light volatile solvent to a thin liquid weighing approximately 7 pounds per gallon, and made specially for use with asphaltic tile.

(3) Cement shall be one of the following types, unless a specific type is recommended by the manufacturer of the tile used.

(a) Emulsion-type cement conforming to Federal Specification SS-A-00138, class 1.

(b) Cut-back type cement conforming to Federal Specification SS-A-128.

c. Design. - The design of the floor shall be a straight checkerboard using one color with grain reversed. Edging strips shall be installed where indicated on the drawings.

d. Preparation of Subfloor. - Surfaces to receive asphalt tile shall be swept clean and shall be free from moisture, paint, oil, and wax. Concrete floors shall have cracks, rough areas, or other surface defects filled with plastic material.

e. Installation. - (1) Priming coat shall be of the same type as the cement and shall be applied to concrete floor in the following manner:

(a) Emulsion-type primer shall be brushed over the entire surface to be covered with asphalt tile. Primer shall be allowed to become thoroughly dry.

(b) Cut-back-type primer shall be worked well into the surface of the concrete with stiff brushes or a straightedged steel trowel using the minimum quantity that will assure covering the surface completely with a nonabsorptive base. Primer shall be allowed to become thoroughly dry.

(2) Cement shall be either of the emulsion type or cut-back type in accordance with the manufacturer's recommendations, and shall be applied to the floor with a notched steel trowel and allowed to set until the surface is tacky, 30 minutes to 3 hours. The notches in the trowel shall be not over 1/16-inch deep and spaced 3/16-inch on centers. The notches shall be maintained at the specified depth, and renewed with a fine triangular file when reduced by wear.

(3) Tile. - When the cement is sufficiently dry, the asphalt tile shall be installed in accordance with the design layout herein specified. Tile shall be laid in such manner that the entire undersurface will be securely bonded in place. Tiles shall be tightly fitted so that each tile is in contact with the surrounding tiles and joints are in proper alignment. The graining in alternate tiles shall be reversed to give a checkerboard appearance.

f. Cleaning. - The asphalt tile shall be thoroughly cleaned of cement spots, dirt, and other soiling and shall be left in a condition satisfactory for waxing. Spots shall be removed by means of a putty knife and steel wool, or by a cloth moistened with a neutral soap of a type approved by the manufacturer of the asphalt tile. The use of solvents, wet-mopping, and washing are prohibited.

g. Protection. - From the time of cleaning until acceptance by the Contracting Officer, the asphalt tile shall be properly protected by a covering of heavy paper, and by board walks in areas where damage to the floor may occur because of subsequent building operations.

34-11. LATHING AND PLASTERING. - a. General. - Plaster shall be installed in bathroom of Operators' Quarters. This paragraph includes lathing and plastering base for ceramic wall tile. The finish coat of plaster shall not be applied on walls until after the wainscots have been installed. Plaster shall be applied on upper surfaces of walls after the wainscots have been installed. Except as otherwise indicated or specified, plaster shall be applied as follows:

(1) Gypsum Plaster. - Gypsum plaster shall be applied over metal or gypsum lath for ceiling and over metal lath only for walls.

(2) Keene's Cement Plaster Finish. - Keene's cement plaster finish shall be applied only over gypsum-plaster base.

(3) Portland Cement Plaster (Ceramic tile base). - Portland cement plaster shall be applied over metal lath. Portland cement plaster shall not be applied to gypsum lath.

b. Materials. - (1) Gypsum Lath. - Gypsum lath shall conform to Federal Specification SS-L-30, 3/8-inch thick sheets.

(2) Gypsum Plaster. - Gypsum plaster shall conform to Federal Specification SS-P-402; type N, fibered for gypsum neat plaster, and type G for calcined gypsum, or shall be the equivalent type conforming to ASTM C 28.

(3) Hydrated Lime. - Hydrated lime shall conform to Federal Specification SS-L-351, type F, with the further requirement that the total free (unhydrated) calcium oxide (CaO) and magnesium oxide (MgO) shall not exceed 8 percent by weight, calculated on the as-received basis. Where it is used for base coats, hydrated lime shall be fibered and mill-mixed at the mill.

(4) Keene's Cement. - Keene's cement shall conform to Federal Specification SS-C-161, type II.

(5) Lightweight Plaster Aggregates. - Lightweight plaster aggregates shall conform to ASTM Standard C 35.

(6) Lime Putty. - Lime putty shall be made from hydrated lime, except that quicklime may be used when adequate time and facilities are available for aging. Suitable precautions shall be taken to protect the putty from exposure to the sun and to prevent excessive evaporation and wind-borne pollution. Lime putty prepared from quicklime shall be allowed to cool completely before using. Lime putty prepared from hydrated lime shall be machine-mixed with water to form a putty and shall be allowed to stand for at least 15 minutes before using.

(7) Metal Lath. - Metal lath shall conform to Federal Specification QQ-B-101c. Expanded metal lath shall be cut from copper-bearing steel sheets, coated with rust-inhibiting paint after cutting, or shall be cut from zinc-coated steel sheets. Wire lath shall be woven from copper-bearing cold-drawn wire, electrically welded and zinc coated, shall have not less than 2-1/2-meshes per inch. Types and weights of lath shall be as specified hereinafter in Paragraph, INSTALLATIONS.

(8) Nails. - (a) Nails for Metal Lath. - Nails for attaching diamond-mesh lath and small-mesh wire lath to horizontal wood supports shall be 1-1/2-inch 11-gage barbed roofing nails with 7/16-inch-diameter heads. Nails for attaching diamond-mesh lath and small-mesh wire lath to vertical wood supports shall be fourpenny common nails or 1-inch 14-gage roofing nails with 7/16-inch-diameter heads driven to a penetration of at least 3/4-inch, or 1-inch wire staples driven home. Nails or staples for attaching 3/8-inch rib lath to horizontal or vertical wood supports shall be 3/8-inch longer than respectively required for the other bases specified above, unless attachment is through the rib, in which case equivalent penetration into the supports shall be provided. Common nails shall be bent over to engage at least 3 strands of flat lath or the rib of 3/8-inch rib lath. Nails for attaching paperbacked wire lath to horizontal or vertical wood supports shall be 12-gage blued U-shaped-head nails driven to a penetration of not less than 3/4-inch and encircling a reinforcing wire of the lath.

(b) Nails for Attaching Gypsum Lath. - Nails for attaching gypsum lath shall conform to Federal Specification FF-N-105, 13-gage blued plasterboard nails with 3/8-inch-or 19/64-inch-diameter flatheads, 1-1/8-inches long.

(9) Plaster-Base Accessories. - (a) Cornerite. - Cornerite shall be strips of zinc-coated or painted expanded metal 6-inches wide, bent to form two 3-inch wings, and weighing not less than 2.5 pounds per square yard.

(b) Strip Lath. - Strip lath shall be painted expanded metal not less than 3 inches wide, and weighing at least 2.5 pounds per square yard.

(10) Portland Cement. - Portland cement shall conform to Federal Specification SS-C-192d, type I, or to SS-C-208b. Only one brand shall be used in the work.

(11) Sand. - (a) Sand for Portland Cement Plaster. - Sand for portlant cement plaster shall conform to ASTM Standard C 114.

(b) Sand for Gypsum Plaster. - Sand for gypsum plaster shall conform to ASTM Standard C 35.

(12) Water. - Water shall be clean and free from oils, acids, alkalies, and organic or other injurious matter.

c. Delivery and Storage. - Manufactured materials shall be delivered in the original packages, containers, and bundles bearing the name of the manufacturer and the brand. Plaster, cement, lime, lath, and accessories shall be stored off the ground under watertight cover, and away from sweating walls and other damp surfaces, until ready for use. Damaged or deteriorated materials shall be removed from the premises.

d. Installations. - (1) Cornerites. - Where plaster finish is required, cornerites shall be installed in the following locations.

(a) At Interior Angles.

Where the abutting surfaces are metal lath, except where metal lath is continued around the corner not less than 3-inches.

(b) At the Junction Between Ceiling and Wall Surfaces. - At the junction between ceiling and wall surfaces, except where the metal lath is turned down at least 3-inches on the walls. Cornerite shall be tied securely to abutting lathed surfaces at the outer edges only. Cornerite shall be attached to gypsum lath at intervals not over 6-inches on centers, by fastenings staggered on the two edges, but nails shall not extend through the lath into the supports.

(2) Gypsum Lath. - Gypsum lath shall be applied with the long dimension across the supports. Boards shall be abutted snugly, and end joints shall be made over supports. End joints shall be staggered in alternate courses, in between. Gypsum lath shall be nailed at each end and at each intermediate bearing, using 4 nails spaced not over 5-inches on centers for a 16-inch board. Nailed edges shall have a full firm bearing and the boards closely fitted at internal angles, corners, and around electric outlets and similar openings. Nails shall be not less than 3/8-inch from ends and edges of lath, and shall be securely driven with the face of the nailhead flush with the face of the lath. Internal angles shall be fitted with cornerite attached by clips, wiring, or nailing along the outstanding edges of the lath. When approved, a spring clip or floating wall type of attachment may be used in place of the nailing specified above. Corners at openings shall be reinforced with strip lath diagonally across the corners, securely nailed through the gypsum lath into adjacent stud.

(3) Metal Lath. - Metal lath shall be applied in such manner as to form true surfaces, straight or in fair curves, without sags or buckles, and with the long dimension of the lath at right angles to the direction of the supports. Metal lath shall be applied to walls with the lower sheet lapping over the upper sheet. Metal lath shall be nailed to supports at intervals not exceeding 6 inches. The sidelaps of lath on walls and partitions shall be secured to supports and tied at intervals not exceeding 9 inches between supports. The sidelaps of lath in ceilings shall be secured to supports and tied at intervals not exceeding 6 inches between supports. The uses of the various types of metal lath shall be as follows:

Metal Lath

Type	Over vertical supports	p.s.y.	Over horizontal supports	p.s.y.	Support spacing
F	Expanded metal	2.5 or 3.4	Expanded metal	3.4	Not over 16 in. on centers
F	Wire	2.5			" " "
FR	Expanded metal	2.75	Expanded metal	2.75	" " "
F3/8R	Expanded metal	3.4	Expanded metal	3.4	" " "

Metal lath shall be lapped at the sides not less than 1/2-inch. Adjoining sheets of small-opening lath shall be lapped at the ends not less than 1-inch, and such laps shall be staggered and, in all cases, occur only over supports. The ends of the sheets shall be at least one support distant from any angle or corner, and the sheet shall be bent into the re-entrant angle or around the corner; otherwise, cornerite shall be used. Lath applied to ceilings shall be bent at the intersection with walls, partitions, and other vertical surfaces to be plastered, and shall be carried down at least 6-inches.

(4) Strip Lath. - Strip lath not less than 3-inches wide shall be installed over joints between dissimilar base materials where the surfaces to be plastered lie in the same plane, and where the base materials cannot be effectively bonded or tied together.

e. Grounds. - Wood grounds shall develop an average plaster thickness of not less than 5/8-inch, measured from the face of metal lath, or not less than 1/2-inch from gypsum plasterboard to the finish plastic surface.

f. Mixing of Plaster. - Except where hand-mixing of small batches is approved, mechanical mixers of an approved type shall be used for the mixing of plaster. Materials shall be accurately measured in a device that will maintain the specified proportions within a plus or minus tolerance not in excess of 5 percent by volume. Frozen, caked, or lumped materials shall not be used. Mechanical mixers, mixing boxes, and tools shall be cleaned after mixing each batch and kept free of plaster from previous mixes. Plaster shall be thoroughly mixed with the proper amount of water until uniform in color and consistency. Retempering will not be permitted, and all plaster that has begun to stiffen shall be discarded. This provision does not apply to lime plaster unless portland cement has been added. Plaster for scratch coats over metal lath shall be fibered by the use of fibered gypsum plaster.

g. Proportioning. - (1) Gypsum Plaster. - The proportioning of aggregate to 100 pounds of the gypsum plaster shall not exceed the following.

Gypsum Plaster

	Gypsum neat plaster, fibered or Gypsum ready-mixed plaster		Gypsum wood-fibered plaster
Three-coat work over metal with	Sand, cu. ft.	Perlite or vermiculite, cu. ft.	Sand, perlite, or vermiculite, cu. ft.
Scratch coat	2	2	1
Brown coat	3	2	2
Over gypsum lath	2-1/2	2	1

Mill-mixed gypsum-perlite plaster may be applied at the contractor's option in lieu of job-mixed lightweight-aggregate plaster, provided the proportions specified above are used.

Finish Coat

Keene's cement	1 part Keene's cement, 1/4 part dry hydrated lime, 1/10 part fine white sand when approved, by weight.

(2) Portland Cement Plaster For Ceramic Tile Base. - Each coat shall be proportioned as follows:

(a) Scratch coat for foundation coat shall be composed of 1 part portland cement to 3 parts sand, with the addition of 10 percent hydrated lime by volume of the cement used.

(b) Float coat shall be composed of 1 part cement, 1 part of hydrated lime, and 3-1/2 parts sand.

h. Application of Plaster. - When the prevailing outdoor temperature is less than 55 degrees F., a uniform temperature of not less than 55 degrees F. shall be continuously maintained in the buildings for a period of not less than 1 week prior to application of plaster, while the plastering is being done and after the plaster is dry. Heating devices shall be placed as near as practicable to the center of the room, and shall be piped out through an opening in an exterior wall. Properly regulated ventilation shall be provided. Plaster shall not be applied when the surfaces contain frost. Gypsum plaster shall be applied in three coats. Finish coats shall have a reasonably uniform thickness of approximately 1/8-inch, and the minimum thickness at any point shall be 1/16-inch. The thickness of the gypsum plaster, from the face of the plaster base to the finished plaster surface, shall be not less than 5/8-inch over metal lath and not less than 1/2-inch over gypsum lath.

(1) Three-Coat Work. - Gypsum Plaster. - (a) Scratch Coat. - Scratch coat shall be applied with sufficient material and pressure to form a good bond with plaster base and to form full keys on metal lath and shall be not less than 3/16-inch over the face of the metal, then scratched to form a rough surface.

(b) Brown Coat. - Brown coat shall be applied after the scratch coat has set firm and hard, shall be brought out to grounds, straightened to a true surface, and cross-raked, ready to receive the finish coat.

(c) Finish Coat. - In the application of trowel finishes, the use of excessive water shall be avoided.

1. Keene's Cement Finish. - Keene's cement finish shall be applied over a partially dry base coat or over a thoroughly dry base coat which has been evenly wetted by brushing or spraying, shall be scratched in thoroughly, laid on well, doubled back, and filled out to a true, even surface. The thickness shall be from 1/16 to 1/8-inch. The finish shall be allowed to draw a few minutes and then shall be well troweled with water to a smooth finish, free from blemishes and irregularities. Troweling shall continue until the finish sets.

(2) Portland Cement Plaster. - Portland cement plaster shall be two-coat application not less than 3/4-inch thick. Scratch coat shall be not less than 1/4-inch thick. While still plastic, the scratch coat shall be deeply scored or scratched and cross-scratched. The scratch coat shall be protected and kept reasonably moist during the seasoning period. Mortar for scratch and float coats shall be used within 1 hour after mixing. The retempering of partially hardened plaster will not be permitted. The scratch coat shall be applied not more than 48 hours nor less than 24 hours before starting the setting of tile. The float coat shall be brought flush with screeds or temporary guide strips so placed as to give a true and even surface at the proper distance from the finished face of the tile.

i. Sampling. - Where samples taken from plasterwork in place show evidence of oversanding or other deficiencies, the limits of the defective work shall be determined and shall be removed and replaced by the contractor.

j. Patching. - Plaster containing cracks, blisters, pits, checks, or discoloration will not be acceptable. Such plaster shall be removed and replaced with approved plaster conforming to this specification. Patching of defective work will be permitted only when approved and such patching shall match existing work in texture and color.

k. Marble Threshold. - Install marble threshold at bathroom entrance. Marble shall be Georgia Cherokee, Alabama Vein White, Vermont Standard White, or similar approved light colored marble. Surface exposed to foot traffic shall be hoved. Threshold shall be bedded solid with portland cement mortar.

34-12. CERAMIC TILE. - a. General. - This paragraph covers ceramic floor and wall tile for the Operators' Quarters bathroom. Containers shall be delivered to the site with labels intact and seals unbroken and shall not be opened until inspected. Work under this section shall not be performed unless a temperature of at least 50 degrees F. can be maintained without interruption for 3 days after completion of the installation.

b. Materials. - Materials shall conform to the respective specifications and other requirements specified below:

(1) Building Paper. - Federal Specification UU-P-147b, type VI or VII, class B.

(2) Calking Compound. - Federal Specification TT-C-598.

(3) Felt, Asphalt-Saturated. - Federal Specification HH-F-191, type I, 15-pound weight.

(4) Hydrated Lime. - Federal Specification SS-L-351, type M or type F, with the further requirement that the total free (unhydrated) calcium oxide (CaO) and magnesium oxide (MgO) in the hydrated product shall not exceed 8 percent by weight, calculated on the as-received basis.

(5) Portland Cement. - Portland cement, including white cement, shall conform to Federal Specification SS-C-192d, type I.

(6) Sand. - Sand shall be clean, washed, sharp, durable, fine aggregate, free from silt, loam, clay, soluble salts, and organic impurities. Sand for setting beds of floors shall be well graded passing a No. 8 sieve, with not more than 5 percent passing a 100-mesh screen. Sand for grout shall be screened to pass a 30-mesh sieve with not more than 5 percent passing a 100-mesh screen.

(7) Tile. - Tile shall conform to the applicable requirements of Simplified Practice Recommendation R 61, standard grade. A "master grade certificate" signed by the manufacturer and the contractor shall be delivered to the Contracting Officer before the tile-setting work is begun. The labels on the tile containers shall be marked to correspond with the marks on the certificate.

(a) Ceramic-Mosaic Floor Tile. - Ceramic-mosaic floor tile shall be either porcelain, natural-clay, or vitreous type, 1/4-inch thick, with plain or cushion edges. Ceramic floor tile shall be laid as a three-unit random mosaic design having the small unit not over 1- by 1-inch, or a two- or three-rectangular-unit pattern having the large unit not over 2- by 2-inch size. Color of floor tile shall be in accordance with the color schedule or as selected from the manufacturer's stock color samples submitted for approval.

(b) Glazed Wall Tile. - Glazed wall tile shall be nominal 4-1/4-inch squares, not less than 1/4-inch thick, and shall have a nonvitreous body and glazed surface with matte glaze finish. Wall tile shall be cushion edge and shall include all stops, returns, trimmers, caps, and other special shapes required to produce a complete and neatly finished installation. Color of wall tile shall be in accordance with color schedule or as selected from the manufacturer's stock color samples submitted for approval.

(8) Water. - Water shall be clean and free from injurious amounts of oil, acids, soluble salts, and organic impurities.

c. Accessories. - Porcelain-type accessories as specified below shall be provided for bathroom. The color of accessories shall match the color of the wall tile or the trim, or shall be as selected and approved.

(1) Recessed soap holder and grab-bar combination, 6" x 6".

(2) Soap holder, 4-1/2" x 4-1/2".

(3) Toilet paper holder, recessed, 6" x 6".

(4) Tumbler and tooth brush holder, 4-1/2" x 4-1/2".

(5) Towel Bars. - One 18-inches in length and one 24-inches in length, installed where directed.

d. Installation of Floor Tile. - Floor-tile operations occuring in spaces requiring both floor and wall tile shall not start until wall-tile setting has been completed.

(1) Laying Out Work. - Floor shall be laid from the center-lines outward and adjustments shall be made at the walls with a minimum of cut tiles.

(2) Installation of Setting Bed Over Wood Subfloor. -

(a) Waterproof Building Paper or Felt. - Waterproof building paper or felt shall be laid over the wood subfloor and turned up at least 2-inches at vertical intersections. Joints between sheets shall be lapped 2-inches and nailed as required to keep the paper or felt flat.

(b) Reinforcement. - The setting bed shall be reinforced with galvanized wire mesh or expanded metal lath. Reinforcement shall be flattened and laid over the waterproof paper or felt with uncut edges lapped the width of 1 mesh and cut ends and edges lapped not less than 2-inches. The mesh shall be tied together at laps with galvanized 18-gage iron or soft-steel wire, at intervals of not more than 10-inches along the finished edges and not more than 7-inches along the cut ends and edges of mesh. The mesh shall be secured to the wood subfloor with the minimum number of staples required to hold the mesh flat, driven to within 1/4-inch of the paper or felt.

(c) Setting Bed Mortar. - Setting bed mortar shall be composed of 1 part portland cement and 3 parts sand, to which not more than 5 percent of hydrated lime, by volume of the cement, may be added, mixed with as little water as will produce a workable mass.

(d) Installation of Setting Bed. - Mortar shall be spread over the reinforcing mesh with a screed forcing out all air pockets and providing a level and smooth bed. The average thickness of the setting bed shall be 1-inch but in no case less than 3/4-inch. The area of the bed to be spread in a single operation shall not be greater than can be covered with tile during the same working period.

(3) Laying Ceramic-Mosaic-Tile Floor. - When the setting bed has set sufficiently to be worked over, neat portland cement shall be sprinkled over the surface and the tile laying begun. Straightedges shall be set to the lines established and be reset at suitable intervals to keep the joints parallel over the entire area. The sheets of ceramic-mosaic tile shall be laid to the straightedges, with the joints between sheets the same as the joints between the tiles on the sheets, after which the tile shall be tamped solidly onto the bed, using wood blocks of such size as to insure solid bedding free from depressions. Fractional changes in dimensions without varying the uniformity of joint widths will be permitted. Tile shall be cut with a suitable cutting tool, and rough edges shall be rubbed smooth. Cut-tile misfits shall be replaced with properly cut tile.

(4) Grouting. - When the setting bed has hardened sufficiently, the paper sheets on ceramic-mosaic tile shall be moistened and removed, and the joints completely filled with grout by screeding and brushing the grout mix over the tile until the joints are thoroughly filled. All excess grout shall be removed. Not less than 48 hours shall elapse before ordinary foot traffic is permitted on the floor. Grout shall be mixed as follows: Grout for joints in ceramic-mosaic tile shall be a thick soupy mix of neat portland cement.

e. Installation of Wall Tile. - (1) General. - The application of the scratch coat shall not start until waterproof paper or felt has been laid over the wood subfloor. The waterproof paper or felt shall be protected with boards or additional building paer while the tile setters are at work. Lathing and plastering is specified under Paragraph "Lathing and Plastering".

(2) Setting Wall Tile. - Wall tile shall be thoroughly soaked in clean water before setting, then set by troweling a skim coat of neat portland-cement mortar on the float coat or applying a skim coat to the back of each tile unit and immediately floating the tile into place. Joints shall be straight, level, perpendicular, and of even width not exceeding 1/16-inch. Wainscots shall be built of full courses, and may extend higher, but in no case more than 1-1/2-inches lower than the height specified or indicated. Tile shall be so laid out that cutting of tile occurs at corners and no tile less than half full width is required. Vertical joints shall be continuous and maintained plumb for the entire height of the tile work. Accessories shall be supported and installed as recommended by manufacturer.

(3) Grouting. - Joints in wall tile shall be grouted full with a plastic mix of neat white portland cement immediately after a suitable area of tile has been set. The joints shall be tooled slightly concave and the excess mortar shall be cut off and wiped from the face of tile. Any interstices or depressions in the mortar joints after the grout has been cleaned from the surface shall be roughened at once and filled to the line of the cushion edge before the mortar begins to harden. Tile bases or coves shall be solidly backed with mortar. Joints between wall tile and plumbing or other built-in fixtures shall be made with a light-colored calking compound. Immediately after the grout has had its initial set, tile wall surfaces shall be given a protective coat of a noncorrosive soap or other approved method of protection.

f. Cleaning. - Upon completion, all tile floor and wall surface shall be thoroughly cleaned in such manner as not to affect the glazed surface.

g. Curing and Protection. - Tile shall be damp-cured for a period of not less than 48 hours before foot traffic is permitted over finished floor. After curing, the floor shall be covered with building paper. Cracked, broken, damaged, or otherwise faulty tiles shall be removed and replaced without additional cost to the Government.

34-13. LINOLEUM. - Linoleum shall be installed in the kitchen of the Operators' Quarters, in full-length pieces with a minimum of joints. Remnants and seconds will not be permitted. All wrappings or containers with seals unbroken and with the manufacturer's name and brand clearly marked thereon. Packages shall not be opened until inspected by the Contracting Officer. Linoleum shall be stored at temperature of not less than 70 degress F. for at least 24 hours before installation. The temperature in the space in which the linoleum is to be installed shall be maintained at not less than 70 degrees F. for a period of 24 hours before the installation is started, and also during the installation.

a. Materials. - Materials shall conform to the respective specifications and other requirements specified below.

(1) Felt lining shall be semi-saturated asphalt rag felt weighing not less than one pound per square yard.

(2) Linoleum shall be not less than 0.125-inch thick. Colors shall be as selected from the manufacturer's standard colors and patterns. Linoleum shall conform to Federal Specification LLL-L-367, class C, or to Federal Specification LLL-F-471, type I, class A, marbleized.

(3) Waterproof cement shall conform to Military Specification MIL-C-15200.

b. Preparation of Subfloor. - Surfaces to receive linoleum flooring shall be clean and free from dirt, grease, oil, wax, alkali, moisture, and other deleterious matter. Joints and cracks shall be filled with plastic material recommended by the linoleum manufacturer, and finished flush with the surface. Ridges shall be ground smooth. No linoleum shall be laid until the subfloor is thoroughly dry. Loose boards in wood floors shall be securely nailed. Defective boards shall be replaced. Knotholes and cracks 1/8-inch or more in width in floor boards shall be filled with an approved wood filler. Nailheads shall be flush or set. Ridges or other unevenness of surfaces shall be planed, scraped, sanded or ground smooth, and then sealed with an approved floor sealer before the felt lining is applied.

c. Application of Felt Lining. - Felt shall be provided over wood strip flooring. Felt shall be carefully cut to fit around all vertical surfaces. Joints in felt shall be butted with cross joints staggered. Felt shall be applied to the floor with waterproof cement and shall be rolled into the paste to remove air bubbles and insure complete adhesion, using a linoleum-type roller weighing approximately 150 pounds.

d. Application of Linoleum. - Linoleum shall be laid with joints parallel to the walls of the room, and across the joints of the boards in the wood floor. Linoleum shall be accurately cut to form a tight joint at all vertical surfaces. The paste shall be applied to the floor with a toothed spreader to within approximately 4-inches of the seams. The linoleum shall be thoroughly rolled into the paste from the center out to the edges of the strips to remove all air bubbles and secure complete adhesion. A linoleum-type roller weighing approximately 150 pounds shall be used for rolling. Seams shall be lapped at least 1/2-inch, except that when linoleum with a patter is used, the laps shall be 3/16-inch. The waterproof cement shall than be applied to the bands left under the seams, the linoleum cut through both thicknesses using a straightedge as a guide, and the edges of the linoleum strips bedded and rolled into the adhesive, leaving the joints tight and practically invisible. The linoleum shall be so laid that the bottom surface will be well bonded to the underfloor and the top surface left smooth, clean, and free from imperfections. Unless otherwise indicated, the linoleum shall extend under radiators to base or to the backs of recesses, alcoves, or closets. Holes for pipe shall be neatly cut.

e. Edge Strips. - Edge strips shall be provided at exposed edges of linoleum flooring and where thresholds are not required. The strips shall be solid extruded aluminum alloy, 1/8-inch thick and 3/4-inch wide, butt type and rounded or beveled on the exposed edge. The top surface shall be flush with the linoleum. The strips shall be secured to the floor with aluminum alloy screws spaced at 6-inches on centers. Strips shall be drilled and countersunk for the screws.

f. Cleaning. - The flooring shall be thoroughly cleaned of all paste spots, dirt, and other soiling, and left in a clean, smooth condition for waxing.

g. Protection. - After cleaning, the flooring shall be protected by a covering of heavy building paper. Boardwalks shall be placed over the flooring in all areas where damage to the floor might occur because of subsequent building operations.

34-14. BUILDERS' HARDWARE. - a. General. - Builders' hardware shall be furnished and installed as required by the drawings and specifications. All items of builders' hardware shall be carefully fitted and securely attached. Care shall be exercised not to mar or injure other new work. Upon completion of the work, the contractor shall, in the presence of the Contracting Officer, show that all hardware works in perfect order, shall fit all keys in their respective locks, and upon acceptance of the work, shall tag and deliver all keys to the Contracting Officer. Oilite bearing butts may be furnished in lieu of ball bearing butts at option of contractor.

b. Lock Sets. - Lock sets shall embody locking mechanism herein specified and trim conforming to the design specified. Where the exact types of hardware specified are not adaptable to the finished shape or size of members requiring the hardware, suitable types having as nearly as practicable the same operation and quality as type specified shall be furnished. Locks shall have beveled, rounded or rabbeted faces where required. Solid or wrought bronze knobs shall be installed on the exterior doors of the buildings.

c. Materials. - Materials, unless otherwise specified, shall conform to the applicable requirements of the following Federal Specifications.

FF-H-106a	Hardware, Builders; Locks and Door Trim
FF-H-111a	Hardware, Builders; Shelf and Miscellaneous
FF-H-116c	Hinges, Hardware, Builders
FF-H-121c	Hardware, Builders; Door Closing Devices

Hardware for the various items shall conform to the requirements set forth below:

Double-Hung Windows

2 Sash Balances	Type F1245
1 Fastener	Type 1140
2 Sash Lifts	Type 1212

Aluminum Combination Storm and Screen Doors

See Paragraph 34-08j.

Window Screens (for Double-Hung Windows)

Sash Lift	Type 1212- 2 each screen

Storm Sash (for Double-Hung Windows)

Hangers, Type F1830, galvanized, 2 for each sash.
Fasteners, wing nut type, 2 for each sash.
5-inch friction type, ball-and-socket joint, friction ventilating hook.

Overhead Doors

Hardware as recommended by door manufacturer for type of doors specified. Doors for Utility Building shall be provided with automatic locking device which locks door in closed position, permitting release from interior only. Door for garage shall be provided with a locking device which provides for operations from both sides of door with cylinder lock and key from exterior.

Door Stops

Provide where item of hardware on an opened door might contact wall or other part of building construction. All doors (except metal clad) Type 1322, except Type 1328E in men's toilet and storage and stock room in Utility Building.

Exterior Doors (Utility Building)

3 Butts - 4-1/2 x 4-1/2	Type 2107 x US-10
1 Lock and Lock Set	Type 86 E-5S

Storage Room - Wire Grille Door

3 T Hinges - 6-inch	Type 2209 x US2H
1 Dead Bolt Lock	Type 181K with 4" x 6" steel plate on face of door over lock to prevent tampering- plate cut to accommodate lock cylinder.

Heater Room Door (Interior) Utility Bldg.

3 Butts, type T2135 for Kalemein door and type T2107 for hollow metal door, 4-1/2" x 4-1/2", USP
1 Lockset, type 86B-4
1 Closer, type 3001, Size III

Heater Room Door (Interior) Utility Building

3 Butts - 3-1/2 x 3-1/2	Type 2127 x USP (except door #102)
3 Butts - 4-1/2 x 4-1/2	Type 2127 x USP (Door 102)
1 Lock and Lock Set	Type 85L-4 x emergency key (Toilet Room Door)
	Type 85B-4 (all other 1-3/8" doors)
	Type 86B-4 (1-3/4" door 102)
1 Closer	Type 3001, Size II (Toilet Room Door)

Metal-Clad Door (Fireproof Room)

See Paragraph 34-08d.
1 Padlock, Federal Specification FF-P-101c, type EPA, 1-1/2-inch, with chain.

Toilet and Lavatory Accessories (Interior Toilet - Utility Building)

1 Coat Hook - Type 1172 x US26D
1 Paper Holder, Crane Co., or approval equal, C24-956
1 Soap Dish, Crane Co., or approved equal, C24-940

Awning and Hopper Type Windows

Hardware Standard with manufacture
(See Paragraph relative to windows)

Garage (Swing Door)

3 Butts - 4-1/2 x 4-1/2	Type 2107 USP
1 Lockset, 161A-4	

OPERATORS' QUARTERS

Exterior Door (Front)

3 Butts, 4-1/2 x 4-1/2	Type 2102 US10

1 Lockset, 161A with 5-1/2 x 5-1/2 exterior Escutcheon and with 5" backset

Exterior Doors (Rear and Basement)

3 Butts, 4-1/2 x 4-1/2	Type 2102 US10
1 Lockset, 161A-4	

Interior Doors (Except as otherwise specified)

2 Butts, 3-1/2 x 3-1/2   Type 2127 USP
1 Lockset, 160N-4

Sliding Closet Doors

Similar and approved equal to Sterling Series 500 with surface pulls and floor guides

Bathroom Door

2 Butts, 3-1/2 x 3-1/2   Type 2127, US28
1 Lockset, 161L-4

d. Keys. - Each cylinder lock shall be spin tumbler type and shall be provided with three keys. All keys shall be stamped with the change number. Masterkeying shall be as directed. Two master keys shall be furnished.

e. Finish. - Hardware for exterior face of exterior doors, and window sash, including awning and hopper type, shall be dull bronze, US-10. All butts for Utility Building and Garage shall have a priming coat for painting unless otherwise specified. Finish bathroom side shall be US-27 or US-28 as applicable. All interior hardware unless otherwise specified, shall have a US-10 or US-4 finish. Hardware for storm sash shall be galvanized.

34-15. ROOFING. - Thick butt asphalt strip shingles conforming to Federal Specification SS-S-298 or uniform thickness shingles conforming to Federal Specification SS-S-300, type II, shall be applied by workmen skilled at the trade and shall be laid in accordance with the manufacturers' specifications. Shingles shall be 3 tab, and except at ridges, shall be 12-inches by 36-inches. Colors shall be selected from manufacturers' standard color range by the Contracting Officer. Shingles shall be laid with wood shingle starter course, with all courses not more than 5-inches to the weather. Lead flashing shall be installed around the stack and copper flashing around the chimney and elsewhere as shown on the drawings. A layer of asphalt saturated felt shall be nailed on the sheathing prior to application of shingles.

34-16. SHADES. - a. General. - Shades shall be installed on all windows in Operators' Quarters except awning, awning combination, and bathroom windows, and on all windows of the office of the Utility Building.

b. Materials. - Materials shall conform to the following Federal Specifications.

DDD-S-251b   for "Shades, Windows; Rollers, Slats Cords, and Accessories".

CCC-C-521b for "Cloth; Window Shade", type II or III. Brackets may be malleable iron, stamped steel, or brass, with a brass, copper, nickel, or chromium finish.

c. Installation. - Shades shall be installed in accordance with the manufacturer's instructions. Brackets shall be accurately located and solidly fastened in place, care being taken not to mar or damage existing work. The contractor shall operate all shades in the presence of the Contracting Officer before final acceptance.

34-17. PAYMENT. - a. Payment for the work specified herein except as otherwise specified in subparagraph b. will be made at the applicable lump sum contract prices for Item 97, "Operators' Quarters", Item 98, "Garage" and Item 96, "Utility Building", and will include all costs for earth and rock excavation for foundations after rough grading has been accomplished, backfilling, fill, masonry, and concrete including platforms and aprons, and all utilities to a line 5 feet outside the building lines, and all concrete walks, all as shown on the drawings and as specified herein.

b. Other items of work in connection with the Utility Building, Garage, and Operators Quarters for which separate payment is provided elsewhere in the specifications are designated below.

Topsoiling and Seeding
Preparation of Site
Rough Grading
Exterior Electrical Work
Water Supply System
Sanitary Sewerage System
Pavements
Concrete Curbs
Surface Drainage System

c. Rock Excavation. - The quantity of rock excavation to be paid for will be the number of cubic yards of actual total volume of boulders greater than 1 cubic yard in size removed during the excavation operations and the actual volume of other rock material removed by authorized excavation as defined in Section 3 of these specifications. Rock excavation shall be made in accordance with the applicable provisions stated in Section 3 of these specifications. Payment for rock excavation will be made at the contract unit price for Item No. 6 "Rock Excavation General" for the specific site of the work and will include payment for all work in connection therewith.

SECTION 35

PLUMBING, GENERAL-PURPOSE
INDEX

Paragraph No.	Paragraph Title	Page No.
35-01	Scope	35-1
35-02	Applicable Specifications	35-1
	a. Federal Specifications	35-1
	b. American Society of Mechanical Engineers Publication	35-2
	c. Hydraulic Institute Publication	35-2
35-03	General	35-2
	a. Utilities	35-2
	b. Cross Connections and Interconnections	35-2
	c. Specifications	35-2
	d. Connections to Equipment and Fixtures Specified Elsewhere	35-3
	e. Drawings	35-3
	f. Cutting and Repairing	35-3
	g. Protection to Fixtures, Materials and Equipment	35-3
35-04	Approval of Materials, Fixtures, and Equipment	35-4
35-05	Excavating, Trenching and Backfilling	35-4
35-06	Materials and Equipment	35-4
	a. Calking Lead	35-4
	b. Fittings	35-4
	c. Pipe and Tubing	35-4
	d. Plumbing Fixtures and Drains	35-4
	e. Plumbing-Fixture-Setting Compound	35-4
	f. Plumbing-Fixture-Setting Gaskets	35-4
	g. Sheet Lead	35-5
	h. Twisted-Jute Packing	35-5
	i. Valves	35-5
35-07	Soil, Waste, Drain and Vent Piping	35-5
	a. Installation	35-6
	b. Joints	35-6
35-08	Cleanout Plugs and Test Tees	35-6

Paragraph No.	Paragraph Title	Page No.
35-09	Flashings	35-6
35-10	Traps	35-6
35-11	Drains	35-7
	a. Floor Drains	35-7
	b. Roof Drains	35-7
35-12	Water Pipe, Fittings, and Connections	35-7
	a. Copper Tubings and Fittings	35-7
	b. Installation	35-8
	c. Joints	35-8
	d. Sterilization	35-8
35-13	Valves	35-9
35-14	Unions	35-9
35-15	Hose and Lawn Faucets	35-9
35-16	Insulation	35-9
35-17	Pipe Sleeves, Hangers, and Fixture Supports	35-10
	a. Pipe Sleeves	35-10
	b. Pipe Hangers, Inserts, and Supports	35-10
	c. Fixture and Equipment Supports and Fastenings	35-11
35-18	Floor, Wall, and Ceiling Plates	35-12
35-19	Electrical Work	35-12
35-20	Painting	35-12
35-21	Electrical Water Heater	35-12
35-22	Types of Fixtures and Fixture Trimmings	35-12
	a. General Requirements	35-12
	b. Cross Connections	35-13
	c. Fixture Connections	35-13
	d. Flush Valves	35-13
	e. Fixtures	35-13

Paragraph No.	Paragraph Title	Page No.
35-23	Hydropneumatic Tanks	35-14
	a. Sight Glass Connections	35-14
	b. Pump Controller Connections	35-14
	c. Air Volume Control	35-14
	d. Pressure Gage	35-14
	e. Pressure Relief Valve	35-14
	f. Air Compressor Unit	35-15
	g. Pressure Switch	35-15
	h. Combination Pump and Air Control	35-15
35-24	Potable Water Storage Tank	35-15
35-25	Decontamination Water Supply	35-15
	a. General	35-16
	b. Suction Pipe	35-16
35-26	Inspection and Tests	35-16
35-27	Guaranty	35-17
35-28	Payment	35-17

SECTION 35

PLUMBING, GENERAL-PURPOSE

35-01. SCOPE. - This section covers plumbing, complete.

35-02. APPLICABLE PUBLICATIONS. - The following specifications and standards of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification:

a. Federal Specifications. -

O-C-114a	Calcium Hypochlorite, Technical and Chlorinated Lime, Technical.
BB-C-120	Chlorine.
CC-M-636a & Am-2	Motors; Fractional Horsepower, (Alternating Current).
HH-C-536a	Compound; Plumbing-Fixture-Setting.
HH-G-116	Gaskets; Plumbing- Fixture-Setting.
HH-I-552	Insulation Pipe Covering, Thermal, and Insulation Blanket, Thermal, Pipe Covering.
HH-P-117	Packing; Jute, Twisted.
QQ-L-156 & Am-1	Lead; Calking.
QQ-L-201a	Lead, Sheet.
QQ-S-775a & Am-1	Steel, Sheets, Carbon, Zinc-Coated.
SS-R-451	Roof-Coating Asphalt, Brushing-Consistency.
WW-H-171b	Hangers and Supports, Pipe (Docks)
W-H_196b	Heaters, Electric; Water, Storage, Noncorrosive.
WW-N-351a & Am-1	Nipples, Pipe, Threaded.
WW-P-401 & Am-3	Pipe and Pipe-Fittings; Soil, Cast-Iron.
WW-P-406b	Pipe, Steel (Seamless and Welded (for Ordinary Use)).
WW-P-460a	Pipe-Fittings; Bronze, (screwed) 125 and 250 Pound.
WW-P-491a & Am-1	Pipe-Fittings; Cast-Iron, Drainage
WW-P-501c & Am-1	Pipe-Fittings; Cast-Iron, Screwed, 125- and 250 Pound.
WW-P-521d & Am-1	Pipe-Fittings; Malleable-Iron, Wrought Iron and Steel (Screwed) 150-Pound.
WW-P-541b & Int. Am-3	Plumbing-Fixtures, Land Use.

WW-T-799a & Am-1	Tubing; Copper, Seamless (For Use with Solder-Joint or Flared-Tube Fittings).
WW-U-516	Unions; Brass or Bronze, 250-Pound.
WW-V-0051b (GSA-FSS)	Valves, Bronze; Angle, Check and Globe, 125-and 150-Pound Screwed and Flanged (for Land Use).
WW-V-54 & Am-2	Valves, Bronze, Gate; 125- and 150-Pound, Screwed and Flanged (for Land Use).
GGG-P-351a	Pipe-Threads; Taper (American National).

b. American Society of Mechanical Engineers Publication. -

Boiler and Pressure Vessel Code Section VIII Unfired Pressure Vessels.

c. Hydraulic Institute Publication. -

Standards of Hydraulic Institute.

35-03. GENERAL. - The general arrangement of the plumbing shall be as indicated on the drawings. Detailed drawings of the proposed departures due to actual field conditions or other causes shall be submitted to the Contracting Officer for approval. Equipment, materials, and fixtures required for use in conjunction with the items to be furnished by the Government, as listed in the SPECIAL CONDITIONS, shall be furnished and installed by the contractor. The contractor shall carefully examine the drawings and shall be responsible for the proper fitting of materials and equipment in each building as indicated, without substantial alteration.

a. Utilities. - Water and drainage piping shall be extended to points 5 feet outside the building where the pipes shall be capped or plugged for extension under other sections of the specifications, except for the fallout shelter decontamination water supply pump suction pipe and tank vent pipe which shall be extended up to the 500 gallon water tank. Utilities shall be installed below frost line. If trenches are closed or pipes are otherwise covered before being connected to street mains, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means.

b. Cross Connections and Interconnections. - No plumbing fixture, device, or piping shall be installed that will provide a cross connection or interconnection between a distributing supply for drinking or domestic purposes and a polluted supply such as a drainage system or a soil or waste pipe in such manner as to make possible the backflow of sewage, polluted water, or waste into the water-supply system.

c. Specifications. - Required materials not covered by the detailed specification shall meet the requirements of the applicable specifications listed hereinbefore, and shall be of the required class, grade, and type. Shop tests of pipe, valves, and fittings, required by Federal Specifications to be conducted in the presence of a Government inspector, are waived.

35-05. EXCAVATING, TRENCHING, AND BACKFILLING. - Excavating, trenching, and backfilling shall conform to Paragraph 34-04 of these specifications.

35-06. MATERIALS AND EQUIPMENT. - The following materials and equipment shall conform to the respective specifications and other requirements specified below:

a. Calking Lead. - Federal Specification QQ-L-156, Type I.

b. Fittings. - (1) Cast-Iron Soil Pipe and Fittings. - Federal Specification WW-P-401.

(2) Cast-Iron Threaded-Fittings. - Federal Specification WW-P-501, Class A or B.

(3) Drainage Fittings. - Federal Specification WW-P-491.

(4) Fittings for Copper Tubing. - Cast-or wrought-bronze or wrought-copper, soldered-joint or flared-type, as hereinafter specified, completely fabricated at the factory. Bronze fittings shall contain not less than 85 percent copper and shall conform to the applicable requirements of Federal Specification WW-P-460. Fittings on Type L tubing shall be of cast or wrought bronze or of wrought copper and shall be of the soldered-joint type. Fittings on type K tubing shall be of cast bronze and shall be of the flared-joint type.

(5) Malleable-Iron Fittings. - Federal Specification WW-P-521, type II.

(6) Nipples. - Federal Specification WW-N-351, same material as pipe system where used.

(7) Unions. - Federal Specification WW-U-516.

c. Pipe and Tubing. - (1) Cast-Iron Soil Pipe. - Federal Specification WW-P-401.

(2) Copper Tubing. - Federal Specification WW-T-799, type K or L, as hereinafter specified.

(3) Steel Pipe. - Federal Specification WW-P-406, Class 2.

d. Plumbing Fixtures and Drains. - Federal Specification WW-P-541.

e. Plumbing-Fixture-Setting Compound. - Federal Specification HH-C-536.

f. Plumbing-Fixture-Setting Gaskets. - Federal Specification HH-G-116, type best suited for the work.

d. Connections to Equipment and Fixtures Specified Elsewhere. - The contractor shall provide all necessary material and labor to connect to the plumbing system all fixtures and equipment having plumbing connections, and which are specified in other sections of these specifications. Drainage connections shall be trapped. The service line to each item of equipment shall be equipped with a cutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures.

e. Drawings. - Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The contractor shall carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly, furnishing such fittings, traps, valves, and accessories as may be required to meet such conditions, at no additional cost to the Government.

f. Cutting and Repairing. - The work shall be carefully laid out in advance, and any excess cutting of construction will not be permitted. Damage to buildings, piping, wiring, or equipment as a result of cutting for installation shall be repaired by mechanics skilled in the trade involved, at no additional expense to the Government.

g. Protection to Fixtures, Materials, and Equipment. - Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury. Upon completion of all work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted and operated.

35-04. APPROVAL OF MATERIALS, FIXTURES, AND EQUIPMENT. - As soon as practicable and within 30 days after award of contract and before any materials, fixtures, or equipment are purchased, the contractor shall submit for approval by the Contracting Officer, a complete schedule in six copies of materials, fixtures, and equipment to be incorporated in the work, together with the names and addresses of the manufacturers and their catalog item numbers and trade names. No consideration will be given to partial lists submitted from time to time. Approval of the materials will be based on manufacturer's published ratings. Approval of materials, fixtures, and equipment under this provision shall not be construed as authorizing any deviations from the specifications, unless the attention of the Contracting Officer has been directed to the specific deviations. Equipment differing from that specified may be proposed, provided the contractor clearly states such differences and provided all essential requirements of the specifications are met. If the equipment offered under this provision is, in the opinion of the Contracting Officer, equal to or better than that specified, it will be given consideration.

g. Sheet Lead. - Federal Specification QQ-L-201.

h. Twisted-Jute Packing. - Federal Specification HH-P-117, type II, tarred.

i. Valves. - (1) Angle, Check and Globe Valves. - Federal Specification WW-V-51, class A or B; type as suitable for the application. Soldered-joint-type valves shall be designated for a water working pressure of 150 pounds per square inch.

(2) Gate Valves. - Federal Specification WW-V-54, type I, II, or III, Class A, and where used in connection with copper tubing, modified therefor.

35-07. SOIL, WASTE, DRAIN, AND VENT PIPING. - All underground and 4" and larger above ground soil, waste, and drain pipe and fittings shall be coated or uncoated extra heavy bell-and-spigot cast-iron. Soil, waste, drain, and vent pipe 3" and smaller above ground shall be galvanized steel or bell-and-spigot cast-iron pipe. Fittings for piping above ground shall be drainage pattern for all threaded drain and waste piping, and cast-iron soil fittings for bell-and-spigot pipe. Fittings on all dry vents shall be malleable-iron or cast-iron.

a. Installation. - (1) Drainage Pipes and Vent Piping. - Horizontal soil and waste pipes shall be given a grade of 1/4 inch per foot where possible, but in no case less than 1/8 inch per foot. All main vertical soil and waste stacks shall be extended full size to the roof line and above as vents, except where otherwise specifically indicated. Where practicable, two or more vent pipes shall be connected and extended as one pipe through the roof. Vent pipes in roof spaces shall be run as close as possible to underside of the roof without forming traps in pipes, using fittings as required. Vertical vent pipes may be connected into one main vent riser above vented fixtures. Where a circuit vent pipe from any fixture or line of fixtures is connected to a vent line serving other fixtures, the connection shall be at least 4 feet above the floor on which the fixtures are located, to prevent the use of any vent line as a waste. The cast-iron bell-and-spigot pipe inside of buildings shall be extended 6 inches above the lowest floor where the floor is supported on the ground, and 6 inches above the ground where the lowest floor is self-supporting.

(2) Fittings. - Changes in pipe size on soil, waste, and drain lines shall be made with reducing fittings or recessed reducers. All changes in direction shall be made by the appropriate use of 45-degree wyes, long- or short-sweep 1/4 bends, 1/6, 1/8 or 1/16 bends, or by a combination of those or equivalent fittings. Single and double sanitary tees and quarter bends may be used in drainage lines only where the direction of flow is from horizontal to vertical. Short sweeps not less than 3 inches in diameter may be used where the change in direction of flow is either from

horizontal to vertical or from vertical to horizontal and may be used for making necessary offsets between the ceiling and the next floor above.

(3) Union Connections. - Slip joints will be permitted only in trap seals or on the inlet side of the traps. Tucker or hub drainage fittings shall be used for making union connections wherever practicable. The use of long screws and bushings is prohibited.

b. Joints. - (1) Cast-Iron Pipe. - Joints in bell-and-spigot cast-iron soil, waste, and vent pipes, or between cast-iron soil, waste, and vent pipes and threaded pipe or calking ferrules, shall be firmly packed with oakum or hemp and calked with lead at least 1 inch deep.

(2) Steel Pipe. - Threaded joints shall have American National taperscrew threads conforming to Federal Specification GGG-P-351, with graphite and oil compound applied to the male thread. Connections between steel pipe and soil pipe shall be similar to joint in cast-iron pipe, and the steel pipe shall have a ring or half coupling screwed on to form a spigot end.

35-08. CLEANOUT PLUGS AND TEST TEES. - Cleanouts shall be the same size as the pipe except that cleanout plugs larger than 4 inches will not be required. Cleanouts installed in connection with cast-iron hub-and-spigot pipe shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to an easily accessible place, or where indicated on the drawings. An extra-heavy cast-brass ferrule with countersunk trap screw cover shall be calked into the hub of the fitting and shall be flush with the floor. Where cleanouts in connection with threaded pipe are indicated and are accessible, they shall be cast-iron drainage T-pattern 90-degree branch fittings with extra-heavy brass screw plugs of the same size as the pipe up to and including 4 inches. Test tees with cast-iron cleanout plugs shall be installed at the foot of all soil, waste, and drain stacks and on each building drain outside the building.

35-09. FLASHINGS. - Vent pipes and roof drains shall be flashed and made watertight at the roof with not lighter than 4-pound sheet lead. Flashings for vent pipes shall be extended up the vent pipes a minimum of 6 inches where threaded standard cast-iron or malleable-iron recess roof couplings shall be installed to form counterflashing or rain guards for pipe. Flashings in connection with cast-iron pipe vents shall be turned down into the pipes or hubs. Flashing shields shall extend not less than 8 inches from the vent pipes and roof drains in all directions.

35-10. TRAPS. - Each fixture and piece of equipment requiring connections to the drainage system , except grease interceptor, shall be equipped with a trap. Traps are specified to be supplied with the fixtures, except traps for grease interceptors. Each trap shall be placed as near to the fixture as possible, and no fixture shall be double-trapped. Traps installed on bell-and-spigot pipe shall be cast-iron. Traps installed on steel pipe shall be recess drainage pattern.

35-11. DRAINS. - Drains shall be made of high-grade, strong, tough, and even-grained metals. Castings shall be free from blowholes, porosity, hard spots, excessive shrinkage, cracks, or other injurious defects, shall be smooth and well cleaned both inside and outside, and shall have all fins and roughness removed. Castings shall not be repaired, plugged, brazed, or burned-in. The wall thickness of iron castings shall be not less than 1/4 inch. Chromium plating shall conform to Federal Specification WW-P-541. The size of the drains shall be determined by the branch sizes indicated on drawings.

a. Floor Drains. - Floor drains shall conform to Federal Specification WW-P-541, type 216.

b. Roof Drains, Flashings, and Expansion Joints. - Roof drains shall be heavy-pattern cast-iron, beehive, or dome-shaped, with an integral flange and a satisfactory device for clamping or otherwise securing the roof covering so as to make a watertight connection. A 4-pound sheetlead flashing 2 feet square extending into the roofing shall be provided as an integral part of the roofing and shall be securely clamped or soldered to body of drain so as to make a watertight, airtight, durable connection. For gravel or slag roofing the drain shall be provided with a suitable gravel stop. Openings in the strainer shall have a combined area equal to twice the area of the drain outlet. The outlet shall be equipped with necessary parts to make proper connection to threaded pipe of same size as downspout. Roof drains shall be of a pattern having an internal expansion joint of proper size to receive the leader pipe. The expansion joint shall be a heavy cast-brass or copper-sleeve type constructed so as to form a watertight flexible joint. The metal of the sleeve shall have a thickness of not less than 0.134 inch (No. 10 stubs gage). Gaskets and packing shall be of asbestos fiber, soft lead, or other suitable and durable material and shall not be located in the flow line of the drainage. Means of adjustment shall be provided for tightening or replacing the gaskets or packing without disturbing leader-pipe connection to the roof drain. The minimum dimensions of the drain shall be as follows:

Size of leader pipe (inches) - - - - - - - - 4
Diameter of Flange (inches) -- - - - - - - - - 8

35-12. WATER PIPE, FITTINGS, AND CONNECTIONS. - a. Copper Tubing and Fitting. - Copper tubing and fitting shall be used for hot and cold water inside of buildings. Tubing above ground shall be type L hard-drawn or type B. Underground tubing shall be type K annealed. Fittings shall be cast-brass or wrought-copper usuitable for sweat connections for use with hard-drawn tubing, and flared-pattern for annealed tubing.

b. Installation. - A gate valve and drain shall be installed on the service line inside the building. Service piping shall be installed below the frost line. The piping shall be extended to all fixtures, outlets, and equipment from the gate valve. The cold-water system shall be installed with a fall toward the shutoff valve. Plugged or capped fittings shall be provided for draining low points of the piping system except where valved outlets are shown on drawings. Bends formed with hydraulic operated pipe benders are acceptable.

(1) Mains, branches, and runouts. - Piping shall be installed as indicated on the drawings. Pipe shall be cut accurately to measurements established at the building by the contractor and shall be worked into place without springing or forcing. Care shall be taken not to weaken the structural portions of the building. Piping above ground shall be run parallel with the lines of the building unless otherwise shown or noted on the drawings. Branch pipe from service lines may be taken off top of main, bottom of main, or side of main using such cross-over fittings as may be required by structural or installation conditions. Service pipe, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering and other work and not less than 1/2 inch between finished covering on the different services. No water piping shall be buried in floors unless specifically indicated on drawings or approved. Changes in pipe sizes shall be made with reducing fittings. The use of long screws and bushings will not be permitted.

(2) Pipe drains indicated on the drawings shall consist of 1/2-inch globe valves with renewable disks and 3/4-inch hose nipples. Additional drains shall be installed at low points on the hot-water piping, and all piping shall grade down to the drains.

(3) Expansion and Contraction of Piping. - Allowance shall be made throughout for expansion and contraction. Horizontal runs over 50 feet in length shall be anchored to the wall or to the supporting construction about midway on the run to force expansion, evenly divided toward the ends.

(4) Air chambers shall be provided on all supplies both hot and cold, near each faucet, control valve, or flush valve, except lawn faucets and hose bibbs. Where not definitely shown on drawings the air chambers shall consist of a 12-inch length of pipe of same diameter as branch supply, with cap.

c. Joints. - (1) Threaded Pipe. - After cutting and before threading, pipe shall be reamed and shall have burs removed. Screw joints shall be made with graphite or inert filler and oil or with an approved graphite compound applied to male threads only. Calking of threaded joints to stop or prevent leaks will not be permitted. Unions shall be provided where required for disconnection of exposed piping.

(2) Flared and Sweated Tubing. - Tubing shall be cut square, and burs shall be removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool before sweating. Care shall be taken to prevent annealing of fittings and hard-drawn tubing when making connections. Installation shall be made by competent workmen in accordance with manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints for soldered fittings shall be made with a non-corrosive paste flux and solid string or wire solder composed of 40 percent tin and 60 percent lead. Cored solder will not be permitted. Joints for flared-type fittings shall be of the compression pattern.

d. Sterilization. - The entire water distribution system shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine conforming to Federal Specification BB-C-120 or calcium hypochlorite or chlorinated lime conforming to Federal Specification O-C-114, and shall be introduced into the system in a manner approved by the Contracting Officer. The sterilizing solution shall be allowed to remain in the system for a period of 8 hours, during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until the residual chlorine content is not greater than 0.2 part per million, unless otherwise directed.

35-13. VALVES. - Valves shall be provided on all supplies to fixtures as specified under TYPES OF FIXTURES AND FIXTURE TRIMMINGS. Valves indicated on drawings in connection with runouts, risers, branches, and mains shall be in accordance with the specification. No valve shall be installed on any line with its stem below the horizontal. All valves shall be gate valves unless otherwise specified or noted on drawings. Valves shall be all brass with sweat-type connections for tubing and shall have wrought bodies.

35-14. UNIONS. - Unions on copper tubing shall be brass, composition B, conforming to Federal Specification WW-U-516. Unions shall not be concealed in walls, ceilings, or partitions.

35-15. HOSE AND LAWN FAUCETS. - Hose faucets inside buildings shall be brass with 1/2-inch male inlet threads, hexagon shoulder, and 3/4-inch hose connection, type 65. Lawn faucets shall be type 207, with 1/2-inch pipe thread inlet and 3/4-inch hose connection outlet.

35-16. INSULATION. - After tests have been completed and surfaces cleaned, insulation shall be installed on all cold water piping except on chromium plated piping. Insulation shall conform to Federal Specification HH-I-552, Type I, Class A, except that insulation shall have a vapor barrier.

35-17. PIPE SLEEVES, HANGERS, AND FIXTURE SUPPORTS. - Pipe sleeves, hangers, and fixture supports shall be furnished and set, and the contractor shall be responsible for their proper and permanent location. Pipe will not be permitted to pass through footings, beams, or ribs unless noted on the drawings.

a. Pipe Sleeves. - Pipe sleeves shall be of cast iron, wrought iron, or steel, properly secured in place, with approximately 1/4-inch space between pipe and enclosing sleeve. Pipe sleeves shall be provided for all pipe passing through walls and floors below finished grade. Sleeves of No. 26 U.S.S. gage galvanized iron of fiber with wall thickness not less than 1/4-inch, or of other suitable approved material, shall be installed with approximately 1/4-inch space all around for all pipes passing through partitions above ground. Where pipes pass through footings, cast-iron pipe sleeves shall be provided not less than 4 inches larger in diameter than pipes for which the sleeves are installed; where pipe covering is used, the sleeves shall be of sufficient size to permit installation of the covering with the usual clearance. Sleeves and chases for piping, inserts for hangers, and similar installations shall be provided in all construction as specified herein. Cutting of construction shall be done only with the permission of the Contracting Officer, and construction shall be repaired to match the original condition by mechanics of the trade which originally executed the work. Under this section the contractor shall do no cutting of woodwork, brickwork, cement work, concrete work, or other materials in the building. Locations and sizes of chases and openings necessary for the proper installation of the work shall be determined in advance and provided during the erection of the work. Sleeves of wrought-iron or steel pipe shall be provided where pipes pass through concrete beams or concrete fireproofing. Sleeves passing through floors shall extend not less than 1-inch and not more than 2 inches above finished floors.

b. Pipe Hangers, Inserts, and Supports. - Hangers shall conform to Federal Specification WW-H-171. Inserts shall permit adjustment of the bolt in one horizontal direction and shall be installed before the concrete is poured. The inserts shall be cast iron, malleable iron, or prefabricated steel, and shall be of a type to receive a machine bolt head or nut after installation. Hangers and supports shall be installed at dimensions not to exceed the maximum limits, and at intervals to keep the pipe alinement and to carry the weight of the pipe and contents.

(1) Horizontal Piping. - Hangers and supports shall be installed as specified hereinafter, and at locations not more than 3 feet from the end of each runout. A hanger shall be installed not over 1 foot from each change in direction of piping. Hangers and turnbuckles shall be types 3, 15, and 17. Type 18 hanger with adjustable swivel nut may be employed to support pipes from toilet rooms to main stacks when space does not permit the use of turnbuckles. Brackets for support of piping at walls shall conform to type 22. In lieu of separate hangers,

the contractor may submit for approval by the Contracting Officer a detail drawing of trapeze hangers with turnbuckles on rods and solid or split-ring clamp for each pipe which he proposes to furnish. Rings shall have a diameter large enough to include the covering for chilled-water piping, and protective saddle type 28 shall be installed with each hanger.

(a) Cast-iron soil pipe shall be supported at not more than 5-foot intervals, and support shall be located near each hub.

(b) Threaded pipe shall be supported at 10-foot intervals.

(c) Copper tubing shall be supported at not more than 6-foot intervals. Hangers for copper tubing shall have proper size rings to suit outside diameter of tubing and shall be copper plated.

(d) Piping in earth shall be laid on a firm bed for its entire length, except where support is otherwise provided.

(2) Vertical Piping. - Supports shall be spaced as specified hereinafter, and at locations not more than 8 feet from end of riser. Pipe clamps shall be type 32.

(a) Cast-iron and threaded pipe shall be supported at each floor and at intervals of not more than 20 feet.

(b) Copper tubing shall be supported at each floor, and between floors by stays or braces to prevent rattle and vibration.

c. Fixture and Equipment Supports and Fastenings. - Fixtures and equipment shall be supported and fastened in a satisfactory manner. Where secured to concrete or brickwork walls, fixtures and equipment shall be fastened with brass bolts or machine screws in lead or corrosion-resisting metal sleeve-type anchorage units or with brass expansion bolts. Expansion bolts shall be 1/4-inch brass bolts with 20 threads to the inch and of sufficient length to extend at least 3 inches into solid concrete or brickwork, and shall be fitted with loose tubing or sleeves of proper length to bring expansion sleeves into the solid concrete or brick wall. Where secured to wood partitions, fixtures and equipment shall be fastened with brass wood screws. Where wood screws are used, screws shall go into solid wood, such as wood inserts, floor joists, studs, or solid pieces set between studs. Exposed heads of bolts and nuts shall be hexagonal with rounded tops finished and chromium-plated, with chromium-plated hexagonal nuts to conceal end of bolts where exposed. Exposed nuts and heads of screws shall be provided with chromium plated brass washers.

35-18. FLOOR, WALL, AND CEILING PLATES. - Uncovered exposed pipes, where passing through floors, finished walls, or finished ceilings, shall be fitted with chromium-plated or enameled cast-iron or steel plates. Plates shall be large enough to completely close the hole around the pipes and shall be square, octagonal, or round, with the least dimension not less than 1-1/2 inches larger than the diameter of the pipe. Plates shall be secured in an approved manner.

35-19. ELECTRICAL WORK. - Motors, controls, and switching and protective devices required for the proper operation of the equipment shall be furnished under this section of the specifications and shall conform to ELECTRICAL WORK, INTERIOR. Motor controllers and protective and signal devices for motor circuits shall be installed and connected under ELECTRICAL WORK, INTERIOR, except where such apparatus is furnished mounted and connected integral with the motor-driven equupment. Final connections to electrical equipment, including motors, together with the installation and connections to all related control and protective equipment, shall be accomplished as a part of the electrical work under ELECTRICAL WORK, INTERIOR. A complete electrical-connection diagram for each piece of mechanical equipment having more than one automatic or manual electrical control device shall be submitted to the Contracting Officer for approval.

35-20. PAINTING. - Pipe hangers, supports, and other iron work concealed or in unfinished spaces shall be thoroughly cleaned and painted with one coat of black asphaltum varnish. Finish painting of exposed pipe, pipe covering, hangers, supports, and other iron work shall conform to Section, PAINTING.

35-21. ELECTRICAL WATER HEATER. - Electric water heater shall conform to Federal Specification W-H-196, type II, size 30. Tank shall be constructed of a non-ferrous metal. Thermostats adjustable range shall have a maximum setting of 105° F.

35-22. TYPES OF FIXTURES AND FIXTURE TRIMMINGS. - Types of fixtures and fixture trimmings specified herein shall be furnished and installed complete with all trimmings and fittings, unless otherwise specified under the item. The item numbers correspond with the "P" numbers notched at the plumbing fixtures on the drawings.

a. General Requirements. - References made herein to outfit numbers and figure numbers of vitreous china and enameled cast-iron plumbing fixtures are to Federal Specification WW-P-541, unless otherwise indicated. Fixtures and trimmings not covered by Federal Specification WW-P-541 shall be considered special, but shall be of equal quality and material. Generally, all fixtures except water closets and urinals shall have the water supply above the rim. Fixtures with the supply discharge below the rim shall be equipped with backflow preventers. Angle stops straight stops, stops integral with the faucets, or concealed type of lock-shield loose-key pattern stops for supplies shall be furnished and installed with fixtures. Exposed traps and supply pipes for all fixtures and equipment shall be connected to the rough piping systems at the wall unless otherwise specified under the item. Floor and wall plates and escutcheons shall be as specified hereinbefore or as covered by the outfit numbers. The exposed fixture trimmings and fittings shall be chromium-plated on nickel-plated brass with polished bright surfaces conforming to Federal Specification WW-B-541.

b. Cross Connections. - Fixtures and trimmings shall be designed to prevent the backflow of polluted water or waste into the water-supply system.

c. Fixture Connections. - Where space conditions will not permit standard fittings in conjunction with the cast-iron floor flanges, special short-radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made absolutely gastight and watertight with a closet-setting compound in accordance with Federal Specification HH-C-536, or with gaskets in accordance with Federal Specification HH-G-116. Rubber gaskets or putty will not be permitted for these connections. Bolts shall be not less than 1/4-inch in diameter and shall be equipped with chromium-plated nuts and washers. Fixture with outlet flange shall be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used; no fixture shall be set in place until the Contracting Officer has examined and approved such flange.

d. Flush Valves. - Flush valves shall be of the non-hole-open type.

e. Fixtures. -

(1) P-1, Water Closet; Outfit VW9, Figure 10.03.

(2) P-2, Urinal; Outfit VU13W, Figure 10.10 wall-mounted, without chair carrier.

(3) P-3, Lavatory; Outfit EL20B, Figure 11.04.

(4) P-3A, Lavatory; Outfit VL24P, Figure 10.18

(5) P-4, Sink; Outfit EK30S, Figure 11-05.

(6) P-5, Sink; Outfit EK24GF, Figure 11.11. Provide Hudee ring for installation in counter top.

(7) P-6, Laundry Tray; Outfit MT48, Figure 14.05. Trap shall be type 106.

(8) P-30, Drinking Fountain; Outfit VD13, Figure 10.23.

(9) P-24, Tub; Outfit EB60DL, with Figure SCC Shower with Curtain rod.

(10) P-7, Shower, similar or equal to Speakman Company #S-2077 complete with self closing valve and chain.

(11) P-8, Shower; similar or equal to Speakman Company #S-2085, complete with self closing valve, air chamber, chain, and pulleys.

(12) P-30A, Drinking Fountain; Outfit VD-10, figure 10.22.

(13) P-9, Chemical toilet shall have standard size and shape toilet seat with removable inner container and attached section for insertion of charcoal deodorizer. Toilet shall be constructed of zinc-coated bonderized steel with white enamel finish. Inner container shall have porcelain enamel finish. Toilet shall be complete with 2 pounds of charcoal deoderizer and 2 gallons of chemical.

35-23. HYDROPNEUMATIC TANKS. - The hydropneumatic tanks shall have a capacity of not less than 220 gallons for the Utility Building, and not less than 80 gallons capacity for the Operator's Quarters. The tanks shall be of galvanized steel and constructed in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels, for 100 psig working pressure. The tanks shall be installed in the vertical position on a suitable steel base ring. The base rings shall be approximately 6 inches high shall be fabricated of 5/16" thick steel and shall be fastened to the floor by clip angles and stud bolts. The base ring shall be provided with cut-outs of adequate size to permit installation and servicing of the tank drain line. The utility building tank shall be provided with a 4-inch x 6-inch handhole, and shall be tapped to receive the inlet and discharge piping, pressure relief valve, air line, pressure gauge, sight glass, and taps for the automatic control connections; location of the control taps shall be determined by the manufacturer of the control equipment. The operator's quarters tank shall be tapped for inlet and outlet discharge piping, pressure relief valve, pressure gauge, sight glass and air volume control.

a. Sight Glass Connections. - A sight glass shall be installed on the tanks. The lower connection shall not be more than 3-inches above the bottom of the straight tank wall and the upper connection shall be no lower than the mid-height of the tank.

b. Pump Controller Connections. - The taps for the pump controller connections shall be set in accordance with the manufacturers recommendations. (Applies to tank in Utility Building only).

c. Air Volume Control. - An air volume control as recommended by the pump manufacturer shall be installed on the tank at the Operator's Quarters only, and connected by copper tubing to the air check valve in the pump.

d. Pressure Gage. - Install an accessible, easily read pressure gage of an approved Bourdon-Spring type on both tanks.

e. Pressure Relief Valve. - A pressure relief valve shall be installed on the top of the tanks and set for pressure relief at 90 p.s.i.g.

f. Air Compressor Unit. - (1) The air compressor shall be of the vertical or vee type, motor driven through suitable V-belt and shall be air-cooled. Compressor shall be mounted on suitable vibration isolators. The belt guard shall be fully guarded. The motor and compressor shall be mounted on a single base which shall be securely anchored to the concrete floor. Capacity of the compressor shall be approximately 1.7 cfm free air at 100 p.s.i.g.

(2) The unit shall be complete with 120/208 volt 3 phase, 60 cycle electric motor, motor magnetic starter, separate hand off automatic selector switch pressure gage and a safety valve set to relieve at 90 p.s.i.g.

g. Pressure Switch. - A double pole pressure switch rated 250 volt suitable for use with operating coil of magnetic motor starter shall be installed on the discharge pipe between the pump and hydropneumatic tank at the Operator's Quarters.

h. Combination Pump and Air Control. - A combination pump and air volume control shall be furnished and installed as shown on the drawings for the Utility Building and specified herein. The control shall start the jet well pump when the water level in the hydropneumatic tank reaches the predetermined low level and stop the pump when the water level reaches the predetermined high level. Should the air pressure in the tank fall below the 60 psi pressure, when the water in the tank is at the high level, the control shall operate the air compressor until the required 60 psi pressure is restored. The control shall be mounted on the heater room wall, and shall be similar to an Automatic Control Co. Gougetrol Dutrol probe model or approved equal.

35-24. POTABLE WATER STORAGE TANK. - The potable water storage tank in the fallout shelter in the flood control gate shaft structure shall be of an eighty (80) gallon working capacity glass lined for long life; construction will be such that no rust will be added to the water. The tank shall be tapped for an inlet fill pipe, discharge pipe, vent pipe and sight glass and constructed for horizontal mounting. The tank shall be supported from the ceiling by means of two (2) 1/4-inch thick by 3-inch wide steel straps. The straps shall be anchored to the ceiling concrete slab by means of 5/8-inch diameter inserts, cast-in-place. The location will be such that the tank will not interfere with the ceiling beams and the discharge outlet is located over the sink below. The fill pipe shall extend up to the operator's floor and a suitable screwed cap be provided, and air gap shall be provided between the fill pipe and tank.

35-25. DECONTAMINATION WATER SUPPLY. - a. General. - Complete system includes water pump unit mounted on top of a 40 gallon hydropneumatic tank. The tank material and installation shall conform to Paragraph 35-23 of this section. Rubber grommets shall be installed between the pump motor unit and the tank and a rubber hose connection between the pump and tank to reduce operating sound to a minimum. All cast iron parts coming in contact with the water are to be protected with baked-on coating to resist rust and corrosion in the pump. The pump impeller shall be bronze, the guide vane and diffuser shall be of a material that is noncorrosive, non-toxic, highly resistant to abrasion. Pump motor shall be of fractional horsepower and shall operate on 120 volts, 60-cycle single phase current. Motor shall be of the capacitor type, and have built-in overload protection.

Pump shall have a capacity of 400 gallons per hour against a discharge pressure of 40 p.s.i. Pump shall operate under a flooded suction condition. The air volume control and adjustable pressure switch shall conform to the applicable portions of the paragraph on hydropneumatic tanks of this section. The pressure switch shall be set to operate when the pressure drops to 20 p.s.i. in the tank and stop the pump when the pressure reaches 40 p.s.i.

b. Suction Pipe. - The suction pipe from the 500 gallon storage tank to the pump shall be wrought iron or copper tubing and conform to the applicable paragraphs under "Water and Sewer Systems". The pipe shall be 1-1/4 inch in size and reduced at the pump to fit the pump suction connection. A 1-1/4 inch globe valve shall be installed on the suction pipe before it connects to the pump. The 1-1/4 inch pipe shall be sleeved through the basement wall in a 2-inch watertight pipe sleeve.

c. Vent Pipe. - The vent pipe from the 500 gallon storage tank shall terminate in the basement fallout shelter room. The one (1) inch vent pipe shall be copper tubing or wrought iron pipe as specified under "Water and Sewer Systems". The vent pipe shall be sleeved through the basement wall in a 2-inch watertight sleeve.

35-26. INSPECTION AND TESTS. - a. Methods of Sampling, Inspection, and Tests for Fixtures. - Methods of sampling, inspection, and tests for fixtures shall conform to Federal Specification WW-P-541.

b. Tests for Plumbing Systems. - Soil, waste, vent, and water piping shall be tested by the contractor and approved by the Contracting Officer before acceptance. Soil and waste piping located underground shall be tested before backfilling. Equipment required for test shall be furnished by the contractor without additional cost to the Government.

(1) Drainage System. - (a) Water Test. - The entire drainage and venting system shall have all necessary openings plugged to permit the entire system to be filled with water to the level of the highest vent stack above the roof. The system shall hold this water for 30 minutes without showing a drop greater than 4 inches. Where a portion of the system is to be tested, the test shall be conducted in the same manner as described for the entire system, except that a vertical stack 10 feet above the highest horizontal line to be tested may be installed and filled with water to maintain sufficient pressure, or a pump may be used to supply the required pressure. The pressure shall be maintained for 30 minutes.

(b) Air Test. - If tests are made with air, a pressure of not less than 5 pounds per square inchs shall be applied with a force pump and maintained at least 15 minutes without leakage. A mercury-column gage shall be used in making the air test.

(c) Final test of the completed drainage and vent system may be either a smoke or a peppermint test. When the smoke test is employed, the smoke shall be produced by a smoke machine, and a pressure equal to 1-inch water column shall be maintained for 15 minutes before starting inspection. When the peppermint test is preferred, 2 ounces of peppermint shall be introduced into each line or stack. Defects discovered shall be eliminated by resetting the fixtures and equipment with new gaskets.

(2) Water System. - Upon completion of the roughing-in and before setting fixtures, the entire hot-and cold-water piping systems shall be tested at a hydrostatic pressure of not less than 100 pounds per square inch gage, and proved tight at this pressure for not less than 30 minutes in order to permit inspection of all joints. Where a portion of the water-piping system is to be concealed before completion, this portion shall be tested separately in a manner described for the entire system.

(3) Defective Work. - If inspection or test shows defects, such defective work or material shall be replaced and inspection and tests repeated. Repairs to piping shall be made with new material. No calking of screwed joints or holes will be acceptable.

(4) Cleaning and Adjusting. - At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves, and fittings shall be cleaned of grease, metal cuttings, and sludge which may have accumulated by operation of the system for testing. Any stoppage or discoloration or other damage to parts of the building, its finish, or furnishings, due to the contractor's failure to properly clean the piping system, shall be repaired by the contractor without cost to the Government. At the completion of the work, the hot-water system shall be adjusted for uniform circulation. Flush valves and other parts of the work shall be adjusted for quiet operation. Automatic control devices shall be adjusted for proper operation.

35-27. GUARANTY. - The following equipment to be furnished under this section of the specifications shall be guaranteed in accordance with the guarantee provisions set forth in the SPECIAL CONDITIONS;

Air Compressor Unit
Plumbing Fixtures
Pneumatic Tanks and Controls
Electric Hot Water Heater
Pressure Relief Valve
Decontamination Water Supply Pump

35-28. PAYMENT. - No separate payment will be made for the work covered under this section, and all costs in connection therewith shall be included in the applicable lump-sum contract prices for the following items of work:

a. Operator's Quarters (Item 97)

b. Utility Building (Item 96)

c. Flood Control Gate Shaft - Miscellaneous (Item 68)

d. Water Supply Intake Tower - Miscellaneous (Item 69)

SECTION 36

HEATING SYSTEM: FORCED-HOT-WATER, OIL-FIRED

(INDEX)

Paragraph No.	Paragraph Title	Page No.
36-01	Scope	36-1
36-02	Applicable Publications	36-1
	a. Federal Specifications	36-1
	b. Military Specification	36-2
	c. U. S. Department of Commerce Commercial Standard	36-2
	d. U. S. Department of Commerce Simplified Practice Recommendation	36-2
	e. American Society for Testing Materials Standards	36-3
	f. American Society of Mechanical Engineers Publication	36-3
	g. American Standards	36-3
	h. Mechanical Contractors Association of American Standards	36-3
	i. Institute of Boiler and Radiator Manufacturers Code	36-3
	j. National Board of Fire Underwriters Standard	36-3
36-03	General	36-3
	a. Standard Products	36-4
	b. Approval of Materials and Equipment	36-4
36-04	Materials and Equipment	36-4
	a. Asphalt Varnish	36-4
	b. Boiler Covering	36-4
	c. Electical Materials and Appliances	36-5
	d. Firebrick	36-5
	e. Fire Clay	36-5
	f. Iron and Steel Sheets	36-5
	g. Mechanical Equipment	36-5
	h. Pipe and Pipe Fittings	36-5

Paragraph No.	Paragraph Title	Page No.
	i. Pipe Covering	36-5
	j. Valves	36-6
	k. Welding Fittings	36-6
36-05	Workmanship	36-6
36-06	Boiler	36-6
36-07	Oil Burning Equipment	36-7
	a. Oil Burner	36-7
	b. Motor	36-8
	c. Automatic-Draft Regulator	36-8
	d. Fuel-Oil Storage Tanks	36-8
	e. Pipe and Fittings	36-9
36-08	Combustion Chamber	36-9
36-09	Foundations	36-9
36-10	Smoke Connections	36-9
36-11	Pressure Gage and Thermometer	36-10
36-12	Pressure Relief Valves	36-10
36-13	Drains	36-10
36-14	Circulating Pump	36-10
36-15	Controls	36-10
	a. General	36-10
	b. Safety Controls	36-11
	c. Water-Temperature Controller	36-11
	d. Thermostats	36-11
36-16	Cold-Water Connection	36-11
	a. Relief Valves	36-12
	b. Strainers	36-12
	c. Pressure-Regulating Valve	36-12
36-17	Expansion Tank	36-12
36-18	Piping	36-12

Paragraph No.	Paragraph Title	Page No.
	a. Branch Connections	36-13
	b. Risers	36-13
	c. Joints	36-13
	d. Pipe Supports	36-13
	e. Pipe Sleeves	36-13
	f. Floor, Wall, and Ceiling Plates	36-13
36-19	Painting	36-14
36-20	Unit Heaters for Utility Building	36-14
	a. General	36-14
	b. Heating Element	36-14
	c. Motors	36-15
	d. Control	36-15
36-21	Installation of Valves	36-15
	a. General	36-15
	b. Flow Control Valve	36-15
	c. Motor-Operated Valve	36-15
	d. Air Vents	36-15
36-22	Boiler Covering	36-16
36-23	Pipe Covering	36-16
36-24	Electrical Work	36-16
36-25	Painting and Finishing	36-16
36-26	Operating and Maintenance Instructions	36-17
36-27	Tests	36-17
36-28	Cleaning of Boilers and Piping	36-18
36-29	Optional Controls	36-18
	a. Pneumatic Controls	36-18
36-30	Guaranty	36-18
36-31	Payment	36-18

SECTION 36

HEATING SYSTEM: FORCED-HOT-WATER, OIL-FIRED

36-01. SCOPE. - This section covers the installation of the forced-hot-water heating system, complete, for the Utility Building and the Operator's Quarters.

36-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification.

a. Federal Specifications. -

HH-B-671d	Brick; Refractory, Fire Clay.
HH-C-168	Cement, Insulation; Thermal, Mineral-Wool.
HH-C-451c	Clay; Fire, Ground.
HH-I-523a & Am-2	Insulation Block, Pipe Covering, and Cement, Thermal, Calcium Silicate (for Temperatures Up to 1200°F.).
HH-I-551a & Am-2	Insulation Block and Pipe Covering, Thermal Cellular Glass.
HH-I-552	Insulation Pipe Covering, Thermal, and Insulation Blanket, Thermal, Pipe Covering.
HH-I-554	Insulation, Thermal, Magnesia, Block, Pipe and Tubing.
HH-I-561c & Int. Am-1	Insulation, Thermal, Asbestos, Block and Pipe-Covering (For Temperatures Up to 750°F.).
HH-I-564	Insulation; Mineral-Wool, Block and Board (for Heated Surfaces).
HH-I-578a	Insulation, Vermiculite; Block and Pipe Covering (Molded).
HH-P-46b	Packing; Asbestos, Sheet, Compressed.

QQ-S-636	Steel; Carbon (Low-Carbon), Sheets, and Strips.
QQ-S-775a	Steel Sheets, Carbon, Zinc-Coated.
TT-V-51c	Varnish; Asphalt.
VV-F-815 & Am-1	Fuel Oil Burner.
WW-N-351a	Nipples, Pipe, Threaded.
WW-P-406b	Pipe, Steel (Seamless and Welded) (For Ordinary Use).
WW-P-501c	Pipe Fittings, Cast Iron, Screwed 125 and 250 Pound.
WW-P-521d & Am-1	Pipe Fittings, Malleable Iron, Wrought Iron and Steel, (Screwed), 150 Pound.
WW-U-531a	Union, Pipe, Steel or Malleable Iron, Threaded Pipe Connection, 250 p.s.i. WSP; 500 p.s.i. WOG (Cold Nonshock).
WW-V-0051b	Valves, Bronze; Angle, Check and Globe, 125 and 150 Pound, Screwed and Flanged (For Land Use).
WW-V-0054a (GSA-FSS)	Valves, Bronze, Gate, 125 and 150 Pound Screwed and Flanged (For Land Use)
WW-V-58	Valves, Cast-Iron, Gate; 125 and 250-lb. Screwed and Flanged (For Land Use)
GGG-P-351a	Pipe-Threads; Taper (American-National).

b. Military Specification. -

MIL-P-15147c	Primer and Enamel, Coal Tar.

c. U. S. Department of Commerce Commercial Standard. -

CS75-56	Automatic Mechanical-Draft Oil Burners Designed for Domestic Installations.

d. U. S. Department of Commerce Simplified Practice Recommendation. -

R157-50	Steel Firebox Boilers and Steel Heating Boilers (Commercial and Residential Types).

e. American Society for Testing Materials Standards. -

A 42-60T	Wrought-Iron Plates.
A 53-58aT	Welded and Seamless Steel Pipe.
A 234-59T	Factory-Made Wrought Carbon Steel and Ferritic Alloy Steel Welding Fittings.
A 285-57T	Low and Intermediate Tensile Strength Carbon-Steel Plates of Flange and Firebox Qualities, Plates 2 Inches and Under in Thickness.

f. American Society of Mechanical Engineers Publication. -

Boiler and Pressure Vessel Code, Section IV Low Pressure Heating Boilers; Section VIII Unfired Pressure Vessels.

g. American Standards. -

B16.9-1958	Steel Built-Welding Fittings.
B19-1938	Safety Code for Compressed-Air Machinery and Equipment.

h. Mechanical Contractors Association of American Standards. -

Net Load Recommendations; Heating Boilers, Baseboard, Convectors, Finned-Tube; Testing and Rating Code for Boiler-Burner Units.

i. Institute of Boiler and Radiator Manufacturers Code. -

Testing and Rating Code for Finned-Tube (Commercial) of Radiation.

j. National Board of Fire Underwriters Standard. -

No. 31	Installation of Oil Burning Equipment (Current Issue).

36-03. GENERAL. - The contract drawings indicate the extent and general arrangement of the heating systems. If any departures from the contract drawings are deemed necessary by the contractor, details of such departures and the reasons therefor shall be submitted in writing as soon as practicable to the Contracting Officer for approval. No such departures shall be made without the prior written approval of the

Contracting Officer. The dimensions of boiler or equipment rooms are as indicated on the drawings. Equipment and piping arrangements shall provide adequate and acceptable clearances for entry, servicing, and maintenance.

a. Standard Products. - The equipment to be furnished under this specification shall be essentially the standard product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be the products of the same manufacturer.

b. Approval of Materials and Equipment. - As soon as practicable and within 30 days after the date of award of the contract, and before commencement of the installation of any materials or equipment, a plan and elevation of the boiler or equipment-room layout showing the proposed piping and equipment, with clearances, together with a complete schedule of the materials and equipment proposed for installation shall be submitted in six copies for the approval of the Contracting Officer. The schedule shall include catalogs, cuts, diagrams, drawings, and such other descriptive data as may be required by the Contracting Officer. No consideration will be given to partial lists submitted from time to time. Approval of equipment under this provision shall not be construed as authorizing any deviations from the specification, unless the attention of the Contracting Officer has been directed to the specific deviations. Equipment differing from that specified may be proposed, provided the contractor clearly states such differences and provided all essential requirements of the specification are met. If the equipment offered under this provision is, in the opinion of the Contracting Officer, equal to or better than that specified, it will be given consideration.

36-04. MATERIALS AND EQUIPMENT. - The following materials and equipment shall conform to the respective specifications and other requirements specified below.

a. Asphalt Varnish. - Federal Specification TT-V-51.

b. Boiler Covering. - (1) Calcium Silicate. - Federal Specification HH-I-523.

(2) Cellular Glass. - Federal Specification HH-I-551.

(3) Magnesia. - Federal Specification HH-I-554, types required for use intended.

(4) Mineral-Wool. - Federal Specification HH-I-564 or HH-I-552, type 1, class A or class B.

(5) Mineral-Wool Insulation Cement. - Federal Specification HH-C-168.

c. Electrical Materials and Appliances. - ELECTRICAL WORK, INTERIOR, of these specifications.

d. Firebrick. - Federal Specification HH-B-671, low duty.

e. Fire Clay. - Federal Specification HH-C-451, class C.

f. Iron and Steel Sheets. - (1) Uncoated (black) Steel Sheets. - Federal Specification QQ-S-636, composition, condition, and finish best suited to the end use.

(2) Galvanized Iron and Steel Sheets. - Federal Specification QQ-S-775, class d.

g. Mechanical Equipment. - Major items of mechanical equipment shall be of the best quality normally used for the purpose in good commercial practice and shall be the products of reputable manufacturers. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a nameplate securely affixed in a conspicuous place. The nameplate of a distributing agent only will not be acceptable. Belts, pulleys, chains, gears, couplings, projecting set screws, keys, and other rotating parts located so that any person may come in close proximity thereto shall be fully enclosed or properly guarded.

h. Pipe and Pipe Fittings. - (1) Asbestos Packing. - Federal Specification HH-P-46.

(2) Cast-Iron Pipe Fittings. - Federal Specification WW-P-501, class A, type required to match adjacent piping.

(3) Malleable-Iron Pipe Fittings. - Federal Specification WW-P-521, type required to match adjacent piping; or in lieu thereof for sizes 2 inches and smaller, brazing-type fittings employing silver solder.

(4) Nipples. - Federal Specification WW-N-351, type A.

(5) Pipe. - Federal Specification WW-P-406, weight A, class 1, coating as hereinafter specified, and the American Society for Testing Materials Standard A 53.

(6) Pipe Threads. - Federal Specification GGG-P-351.

(7) Unions. - Federal Specification WW-U-531, type required to match the adjacent piping.

i. Pipe Covering. - (1) Asbestos. - Federal Specification HH-I-561, type II, III, or IV, class 2.

(2) Calcium Silicate. - Federal Specification HH-I-523, class 2.

(3) Cellular Glass. - Federal Specification HH-I-551.

(4) Magnesia. - Federal Specification HH-I-554.

(5) Mineral-Wool. - Federal Specification HH-I-552, type I, class A.

(6) Vermiculite. - Federal Specification HH-I-578, type I.

j. Valves. - (1) Gates. - Sizes 1-1/2 inch or less, Federal Specification WW-V-54, class A; 2-inch size, Federal Specification WW-V-58, class A, designation NS; over 2-inch size, Federal Specification WW-V-58, class A, designation OS or OF as required.

(2) Globe. - Federal Specification WW-V-51, type I, class A.

(3) Angle. - Federal Specification WW-V-51, type II, class A.

(4) Radiator. - The quick-opening, disk type designed specially for forced hot-water heating systems, constructed of brass or bronze and of the spring-retained-packing type with composition mushroom handles.

(5) Air. - The wooden handle operated heavy pattern type.

k. Welding Fittings. - Welding fittings shall conform to ASTM Standard A 234. Wrought-iron fittings shall conform in physical and chemical properties to ASTM Standard A 72 or A 42. All welding fittings shall conform to American Standard B16.9.

36-05. WORKMANSHIP. - Equipment shall be installed in accordance with the recommendations of the manufacturer and the best standard practice for this type of work.

36-06. BOILER. - Boiler shall be designed for a water-working pressure of 30 pounds per square inch gage, and shall be constructed and equipped in accordance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. The boiler shall be provided with the necessary connections, and shall be equipped with a combined pressure gage and thermometer, a water-temperature regulator, a water-relief valve and a built-in tankless heater. The tankless heater for the

Operator's Quarters shall be rated 5 gpm and for the Utility Buildings, 3 gpm. The boiler shall have a standard nameplate containing the manufacturer's name and address and the trade name and catalog number of the boiler, securely affixed in a conspicuous place. The boiler shall fit the space requirements of the boiler room allowing adequate room for cleaning and maintenance. The capacity of the boiler, based on the ratings in the Net Load Recommendations for Heating Boilers of the Heating, Piping, and Mechanical Association Standards, or determined by the method shown in U. S. Department of Commerce Simplified Practice Recommendation R157, shall be not less than shown on the drawings. The boiler shall have the required capacity when fired with No. 2 fuel oil. The boiler shall be of cast iron and shall be of the rectangular, sectional type specially designed for use with an oil burner and may be jacketed or unjacketed. Unjacketed boilers shall be insulated as hereinafter specified.

36-07. OIL-BURNING EQUIPMENT. - Oil-burning equipment shall include the oil burner, motor, ignition equipment, controls, oil-storage tank, oil pipe and fittings, and all other items necessary for the complete installation of a fully automatic oil-burning heating system. All fuel-oil-burning equipment shall be installed in accordance with Pamphlet No. 31 of the National Board of Fire Underwirters, and shall conform to the requirements of the Underwriters' Laboratories, Inc. The contractor shall submit proof that each item of oil-burning equipment he proposes to furnish conforms to these standards. The label or listing of the Underwriters' Laboratories, Inc., will be accepted as evidence of conforming to this requirement. In lieu of such label or listing the contractor may submit a written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, that the oil-burning equipment has been tested and conforms to the standards, including the method of test, of the Underwriters' Laboratories, Inc.

a. Oil Burner. - Oil burner shall be of the mechanical or air-atomization type suitable for handling No. 2 commercial fuel oil without preheating the oil. The burner shall be quiet in operation, and shall operate with a balanced flame so as not to localize heat in any part of the combustion chamber. The burner shall be capable of complete atomizing and effectively mixing the oil with air so as to insure complete combustion. The air admitted shall be of sufficient quantity for complete combustion, but not of such quantity as to produce an undue percentage of excess air with attendant high stack loss. The oil burner shall operate without clogging or failure, and shall have sufficient capacity to develop not less than the specified boiler capacity. The oil burner shall conform to U. S. Department of Commerce Commercial Standard CS75 when within the scope thereof. The burner units shall be readily accessible for inspection, cleaning, and other purposes. Each burner shall have synchronized control of the quantity of oil, primary air, and secondary air to be supplied. Burners for No. 2 oil shall be equipped with either direct electric ignition or electric-spark-ignited pilot ignition systems.

b. Motor. - Motor shall be of the totally enclosed type and shall be provided with thermal-overload protection. The motor shall suit the current characteristics indicated on the drawings and shall conform to the applicable requirements of ELECTRICAL WORK, INTERIOR. The motor shall have sufficient capacity to operate the oil pump and fan so as to develop the specified boiler rating.

c. Automatic-Draft Regulator. - Automatic-draft regulator shall be installed in the side of each smoke pipe. The regulator shall consist of a weighted and balanced damper of proper size for the boiler capacity. The damper shall open or close automatically as the chimney draft varies, so as to maintain a constant draft at the furnace outlet.

d. Fuel-Oil Storage Tanks. - Fuel-oil storage tanks shall have a capacity as indicated on the drawings. Each tank shall be constructed in accordance with the standards of Pamphlet No. 31 of the National Board of Fire Underwriters and certification to that effect shall be furnished to the Contracting Officer. The tank shall be provided with welded, reinforced threaded openings or flanges for all pipe connections including oil-fill, vent and oil-burner connections. An oil-level indicating device of the hydraulically operated type shall be installed in conjunction with each oil-storage tank.

(1) Cleaning and Painting of Underground Tanks. - The exterior surfaces shall be prepared for painting by steel-grit or sand blasting. Prior removal of oil, grease, and other foreign matter by solvents or mechanical means will not be required provided that blast cleaning alone accomplishes the complete removal of mill scale, rust, oil, grease, welding slag, and other surface contaminants and leaves a surface of uniform appearance, suitably roughened for tenacious adhesion of the coating. As soon after blasting as practicable, and prior to formation of any form of corrosion, the exterior surfaces shall be given a coat of coal-tar primer conforming to Military Specification MIL-P-15147. The primer shall not be heated but shall be applied at temperatures between 60°F. and 80°F. with the relative humidity below 80 percent. At the option of the contractor, surface preparation and priming may be performed either in the manufacturer's plant or in the field. If performed in the plant, the surfaces of the tank shall be thoroughly cleaned in the field of all dirt and debris and inspected for evidence of loose primer, holidays, and areas of primer damaged in transit. All such areas shall be cleaned so as to expose the bright metal, and the entire surface shall be reprimed. After the field-primed, or reprimed, surfaces have dried thoroughly and before expiration of the maximum drying time stipulated by the manufacturer of the coating, a coat of coal-tar enamel conforming to Military Specification MIL-P-15147 shall be hot-applied so as to obtain a dry film thickness

of not less than 1/16-inch. The use of fluxing oils or thinners to reduce susceptibility to cracking in cold weather will not be permitted. Enameling shall be done by men who are thoroughly and specifically experienced in the application of coal-tar enamel and in strict accordance with the recommendations of the coating manufacturer. After the enamel is completely applied and cold, all coated surfaces shall be tested with an electric wire-brush holiday detector operating at 8,000 to 10,000 volts. Any missed places revealed by the test shall be promptly repaired by a single application of hot enamel. Coated tanks shall be handled in a manner which will preclude damage to the coating by impact or abrasion. The excavation shall have a suitably prepared bed, and the tank shall not be dumped or dropped but shall be carefully placed with a minimum of handling. Backfill shall be compacted thoroughly, but with care exercised to avoid damage to the coating.

(2) Cleaning and Painting Above-Ground Tanks. - The exterior surfaces shall be cleaned thoroughly of all loose rust, blisters, loose scale, oil paint of type different from primer and other substances that would interefere with proper adhesion of the protective coating. Mill scale that cannot be removed by hand wire brushing need not be removed. Oil and grease shall be removed with mineral spirits or other acceptable solvent having a flash point higher than 80 degrees F. After cleaning, the outside of the tank shall be painted with one coat of red lead and two coats of aluminum paint conforming to requirements of the "Painting" section.

e. Pipe and Fittings. - Fill and vent piping shall be standard-weight black-steel pipe with malleable iron fittings. Supply and return lines shall be type "K" copper tubing with flared joint type compression fittings. A "Scully" or approved equal, vent alarm shall be installed with each tank.

36-08. COMBUSTION CHAMBER. - Combustion chamber shall be constructed of firebrick laid in thin fire clay batter. The use of plastic or other refractory material in lieu of firebrick will be acceptable provided the setting is recommended by the manufacturers of the boiler and fuel-burning equipment.

36-09. FOUNDATIONS. - Foundations for the boiler and for other heating equipment covered by this specification, when required, shall be constructed in strict accordance with the manufacturers' recommendations and as approved.

36-10. SMOKE CONNECTIONS. - Each boiler shall be connected to the stack or flue by means of a smoke connection constructed of black iron or steel sheets not less than 0.0478 inch in thickness (18 gage). The clear distance between uncovered smoke connections and combustible

49

material or construction, including plaster on combustible base, shall be not less than 18 inches. The clearance may be reduced to 9 inches where the smoke connection is protected by not less than 1 inch of asbestos or its equivalent or where combustible material in ceilings, beams, or walls is protected by sheet metal or equivalent covering placed at least 1 inch from the surface to be protected and extending the full length of the smoke connection and not less than 12 inches beyond it on both sides. Suitable cleanouts shall be provided which will permit cleaning the entire smoke connection without dismantling.

36-11. PRESSURE GAGE AND THERMOMETER. - Pressure gage and thermometer, in combination, having suitable pressure and temperature ranges shall be installed on each boiler.

36-12. PRESSURE RELIEF VALVES. - Each boiler shall be provided with one or more relief valves, constructed and installed in strict accordance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. The aggregate relieving capacity of the relief valves shall be not less than that required by the above Code. The discharge from the valves shall be installed as directed.

36-13. DRAINS. - Drains consisting of 1-inch hose gate valves or 3/4-inch hose bibs shall be installed at the lowest point in the return main near the boiler, and wherever required by the Contracting Officer for the convenient and thorough draining of the system.

36-14. CIRCULATING PUMP. - Circulating pump for hot water shall be of the single-stage, centrifugal type, electrically driven. The pump shall be supported by the piping on which it is installed. The pump shall have a capacity not less than that indicated on the drawings, and shall be integrally mounted with the motor on a cast-iron or steel sub-base. The pump may be either direct-connected by means of a flexible-shaft coupling or close-coupled with an overhung impeller. The pump shaft shall be constructed of steel, the runners and glands of bronze, and the housing of close-grained cast iron. The motor shall have sufficient power for the service required, shall be of a type approved by the manufacturer of the pump, shall be suitable for the available electric service, and shall conform to ELECTRICAL WORK, INTERIOR.

36-15. CONTROLS. - a. General. - (1) Water-Temperature Control. - The boiler water shall be maintained at a fairly constant temperature by means of a water-temperature controller which will cause the oil burner to start or stop automatically as the boiler-water temperature falls below or rises above predetermined points.

(2) Space-Temperature Control. (a) Operators Quarters. - The temperature in the spaces to be heated shall be automatically controlled by means of a thermostat which will cause the circulating pump

to start or stop as the space temperature falls below or rises above predetermined points.

(b) Utility Building. - The radiators in the Utility Building shall be controlled by a room thermostat and a motor operated valve. The thermostat will cause the valve to open or close as the space temperature falls below or rises above the thermostat setting. The circulator shall be controlled by an outdoor thermostat which will cause the pump to start or stop as the outdoor temperature falls below or rises above 65°F. The unit heater shall be controlled as hereinafter specified.

b. Safety Controls. - The contractor shall submit proof that the safety controls conform to the standards of the Underwriters' Laboratories, Inc., or the Factory Mutual Laboratories. The label or listing of the above laboratories will be accepted as evidence of conformance. In lieu of such label or listing, the contractor may submit a written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, that the safety controls have been tested and conform to the standards, including method of test, of the Underwriters' Laboratories, Inc., or the Factory Mutual Laboratories.

(1) Safety stack switch or an equivalent device shall automatically shut off the oil burner in case the oil fails to ignite on starting.

c. Water-Temperature Controller. - Water-temperature controller for the boiler water shall be of sturdy construction and shall be protected againsty dust and dampness. The thermostatic element shall be inserted in a separate socket installed in either the upper part of the boiler or in the hot-water supply line leaving the boiler. The controller shall operate on a 10°F. differential over an adjustable temperature range of approximately 100° to 220°F.

d. Thermostats. - (1) Room thermostats shall be of a lock-shielf type, equipped with thermometers, and designed to operate on a 2°F. differential over a temperature range of approximately 55°F. to 85°F. Room thermostats shall be set to maintain a room temperature of 70°F.

(2) Outdoor thermostats shall be of the adjustable two-position type with an operating range of approximately plus 20°F. to plus 70°F. and shall be provided with a suitable ventilated weather shelter.

36-16. COLD-WATER CONNECTION. - Cold-water connection shall be made to the water supply system as approved. Connections shall be made with copper tubing or brass pipe and brass fittings and shall include gate valve, strainer, pressure-regulating valve, and relief valve, with the relief valve nearest to the boiler.

a. Relief Valve. - The pressure-relief valve shall be adjusted to open automatically when the pressure within the heating system rises above 30 pounds per square inch gage. The discharge from the relief valve shall be installed as directed by the Contracting Officer. The valve shall be equipped with a lever for manual operation.

b. Strainers. - Basket or Y-type strainers shall be of the same size as the pipe lines in which they are installed. The strainer bodies shall be heavy and durable, of the best-grade cast iron, with bottoms drilled and plugged. The bodies shall have arrows clearly cast on the sides to indicate the direction of flow. Each strainer shall be equipped with an easily removable cover and sediment basket. The basket shall be of not less than 0.025 inch thick (22-gage) sheet brass with small perforations of sufficient number to provide a net free area through the basket of at least 3.30 times that of the entering pipe. The flow shall be into the basket and out through the perforations.

c. Pressure-Regulating Valve. - Pressure-regulating valve shall be of a type which will not stick nor allow pressure to build up on the low side. The valve shall be set to maintain a terminal pressure of approximately 5 pounds per square inch in excess of the static head on the system and shall operate within a 2-pound maximum variation regardless of initial pressure and without objectionable noise under any condition of operation.

36-17. EXPANSION TANK. - The expansion tank for the hot water heating systems shall be of the capacity indicated on the drawings. It shall be constructed of steel in accordance with requirements of the ASME Boiler and Pressure Vessel Code, section VIII "Unfired Pressure Vessels" for a working pressure of 30 p.s.i. gage. The tank shall be coated with a suitable rust-inhibiting paint. Tappings shall be provided for a gage glass installation which shall be provided complete with gage cocks and guide rods, and shall be so arranged that the gages can be read easily and all valves will be accessible.

36-18. PIPING. - Pipes shall be cut accurately to measurements established at the building, and shall be worked into place without springing or forcing, properly clearing all windows, doors, and other openings. Excessive cutting or other weakening of the building structure to facilitate piping installation will not be permitted. Pipes shall have burs removed by reaming. Changes in direction shall be made with fittings, except that bending of pipe will be permitted, provided a hydraulic pipe bender is used. Bent pipe showing kinks, wrinkles, or other malformations will not be acceptable. Boiler outlets shall be run full size to the main header. Unless otherwise indicated, horizontal supply mains shall pitch up in the direction of flow and return mains shall pitch down in the direction of flow with a grade of not less than 1 inch in 40 feet. Open ends of pipe lines and other equipment shall be properly capped or plugged during installation to keep dirt and other foreign material out of the system. Pipe not otherwise specified shall be black steel uncoated. Unless otherwise specified or shown on the drawings, final connections to appliances shall be made with malleable-iron unions.

a. Branch Connections. - Branches from the mains shall be taken off at an angle of 45° above the horizontal, unless otherwise indicated on the drawings. Connections shall be carefully made to insure unrestricted circulation, eliminate air pockets, and permit the complete drainage of the system. Branches taken from the tops of mains shall pitch up, and those taken from the bottom shall pitch down from the mains with a grade of not less than 1 inch in 10 feet.

b. Risers. - The locations of risers shown on the drawings are approximate. Exact locations of the risers shall be as approved by the Contracting Officer.

c. Joints. - Screw joints shall be made with tapered threads properly cut. Screw joints shall be made perfectly tight with a stiff mixture of graphite and oil, applied with a brush to the pipe threads only, and in no case to the fittings. Flanged joints shall be faced true, packed, and made up perfectly square and tight. Brazed joints shall be made tight with silver solder.

d. Pipe Supports. - All horizontal runs of pipe shall be securely supported. Suspended pipe shall be held by adjustable clevis-type pipe hangers having bolted hinged loops or by other approved devices. Chain or flat steel strap hangers will not be acceptable. Supports for pipes shall be spaced eight (8) feet on centers.

e. Pipe Sleeves. - All pipes passing through masonry or frame construction shall be fitted with sleeves. Each sleeve shall extend through its respective floor or wall, and shall be cut flush with each surface unless otherwise required. The inside diameter of pipe sleeves shall be at least one-half inch larger than the outside diameter of the passing pipe or pipe covering. Sleeves in bearing walls shall be steel pipe, cast iron pipe, or terra cotta pipe.

f. Floor, Wall, and Ceiling Plates. - All pipes passing through the floors, walls, or ceilings of finished rooms shall be fitted with chrome plated, wall, or ceiling plates securely fastened in place.

Where pipes pass through combustible materials, the opening shall be sufficiently large to provide 1-inch clearance between the pipe and the floor or partition.

36-19. RADIATORS. - Radiators shall be of the extended-surface, steel-tube type, and shall consist of suitable metal fins permanently bonded to steel pipe cores, threaded at each end for connecting to external piping. The return connection shall be made with a balancing union elbow. The supply and return connections shall be of the same size. Radiators shall have capacities not less than indicated on the drawings, determined either in accordance with the Institute of Boiler and Radiator Manufacturer's publication, "Testing and Rating Code for Finned-Tube (Commercial) Radiation," or the test procedure in Commercial Standard CS 140. Radiators shall be equipped with solid fronts, slotted-sloping-top cover grilles, fabricated from steel sheets not less than 9.0478 inch in nominal thickness, independently secured with brackets. Radiators shall be given a coat of rust-inhibiting primer before shipment. Baseboard radiation in Operator's Quarters shall be as shown on the drawings. The front panels shall be constructed of 20-gauge steel and the back panels of 24-gauge steel. The heating element shall consist of aluminum fins mechanically bonded to seamless copper tubing. All units shall be equipped with dampers for temperature control in each room. The length of heating element shall be as shown on the drawings. All accessories shall harmonize in appearance with the contours of the baseboard heating panels.

36-20. UNIT HEATERS FOR UTILITY BUILDING. - a. General. - The unit heater shall have capacities not less than shown on the drawings. The control valves shall be the same size as the supply connection shown on the drawings. The unit heaters shall be rated in accordance with the code adopted by the Industrial Unit Heater Association and the American Society of Heating and Ventilating Engineers, and shall have a b.t.u. capacity not in excess of 125 percent of that specified. Orifice plates may be provided to reduce the b.t.u. output where required. The unit heaters shall be quiet in operation. If, upon completion of installation, a unit heater is considered by the Contracting Officer to be objectionably noisy, it shall be replaced with an acceptable heater at no additional cost to the Government. The unit heaters shall be designed for suspension and arranged for horizontal discharge of air as indicated on the drawings. The casing shall be of sturdy, rigid construction and shall be finished with lacquer or enamel. Suitable, efficient air deflectors shall be provided. The face velocity of the unit heater shall not be in excess of 900 feet per minute.

b. Heating Element. - Heating coil and radiating fin shall be of copper or copper alloy. The heating element shall be free to expand or contract without developing leaks and shall be properly pitched for drainage. The element shall be tested under a hydrostatic pressure of 200 p.s.i., and a certified report of the test shall be delivered to the Contracting Officer.

c. Motors. - Motors shall be provided with 3-position manual selection switches for "ON", "OFF", and "AUTOMATIC" operation; shall be equipped with thermal-overload protection; and shall be of suitable size and speed to operate the fans at their specified capacities. They shall be suitable for operation on a 115-volt, 60-cycle, single-phase circuit.

d. Control. - The unit heater shall be automatically controlled by a room thermostat which shall start and stop the unit heater fan as the space temperature falls below or rises above the thermostat setting.

36-21. INSTALLATION OF VALVES. - a. General. - Valves shall be installed at the location shown on the drawings or where specified. Gate valves shall be used unless otherwise shown, specified, or directed. All valves shall be installed with their stems or spindles above the horizontal.

b. Flow Control Valve. - Flow control valves shall be installed in the supply mains near the boiler. The valve shall operate so that when the circulating pump starts the increased pressure within the main will open the valve and when the pump stops the valve will close. The valves shall be constructed with a cast iron body, and shall be provided with a device whereby the valve may be opened manually to allow gravity circulation. The flow control valve shall be designed for the intended purpose, and shall be installed as recommended by the manufacturer.

c. Motor-Operated Valve. - A motor-operated globe valve shall be installed as indicated on the drawings. The valve shall be of the 2-position type with the valve body constructed of high tensile iron. The inner valve shall have renewable composition discs and V-ported guides. The stem shall be flexibly connected to the inner valve to reduce friction on the stem, and to permit positive seating of the inner valve without binding. The stem packing shall be spring loaded. The valve body shall be designed for static pressure of 125 p.s.i. gage and the electric motor shall have ample power to operate the valve.

d. Air Vents. - Air vents including fittings to permit transfer of air from the boiler to the expansion tank shall be installed as shown on the drawings or as directed by the Contracting Officer. An overflow pipe from the vent shall be run to a point designated by the Contracting Officer. The inlet to the air vent shall be provided with a gate valve.

47

36-22. BOILER COVERING. - The boiler, if unjacketed, shall be covered with magnesia, glass fiber or rockwool insulation at least 1-1/2 inches thick. Insulation shall be applied over 1-1/2 inch wire mesh, held away from the metal surfaces by metal spacers providing an air space of not less than 1 inch. Joints in the insulation shall be filled with magnesia, mineral-wool, or other equally suitable cement. Insulation shall be covered with heavy galvanized hexagonal wire netting and two coats of asbestos cement each approximately 1/4-inch thick. The first coat shall be left with rough surface and allowed to dry before the second coat is applied. The second coat shall consist of two parts by weight of asbestos cement and one part of portland cement, troweled on to a smooth, hard, uniform surface and neatly finished. Cleanout and access openings shall not be insulated, but the insulation and external plaster shall be neatly beveled up to the edge of such openings.

36-23. PIPE COVERING. - All heating-system piping shall be insulated with pipe covering. Pipe covering shall be of standard-thickness magnesia or vermiculite, or thermally equivalent thickness of mineral wool, calcium silicate, cellular glass, asbestos, or other approved non-combustible insulation. Covering shall be held in place with metal strips not less than 3/4-inch wide. Strips shall be spaced to hold the center and ends of each section, and in no case shall the spacing exceed 18 inches. Valves and fittings, except unions and flanges, shall be covered with magnesia cement or mineral-wood cement of the same thickness as the pipe covering. All pipe covering and plastic insulation shall be protected by means of cotton sheeting, weighing not less than 3.5 ounces per yard of 37-1/2 inch width, pasted neatly over the material. Aluminum straps shall not be used for securing sectional pipe covering containing alkaline substances unless the aluminum surface is adequately protected against corrosion.

36-24. ELECTRICAL WORK. - All manual or automatic control and protective or signal devices required for the operation of the heating equipment herein specified and any wiring required but not indicated on the electrical plans shall be furnished and installed under this section of the specifications. Wiring shall conform to ELECTRICAL WORK, INTERIOR. A complete electrical-connection diagram for each piece of mechanical equipment having more than one automatic or manual electrical-control device shall be submitted to the Contracting Officer for approval.

36-25. PAINTING AND FINISHING. - All uncoated ferrous-metal work such as pipe supports and uninsulated piping in areas having unpainted adjacent surfaces shall be thoroughly cleaned and given one coat of asphalt varnish. All other uncoated ferrous-metal work shall be primed and finish painted as specified in Section, PAINTING.

36-26. OPERATION AND MAINTENANCE INSTRUCTIONS. - Operation and maintenance instructions, in printed form, glass-enclosed and framed, covering each item of equipment shall be posted at locations designated by the Contracting Officer. Upon completion of the work, and at a time designated by the Contracting Officer, the services of a competent engineer shall be provided for a period of not less than 1 day to instruct a representative of the Government in the operation and maintenance of the heating system.

36-27. TESTS. - Before any covering is installed, the entire system, including boiler, radiators, unit heaters, and fittings, shall be hydrostatically tested and proved tight under a pressure of 45 p.s.i. gage. Upon completion and prior to acceptance of the installation, the contractor shall subject the heating system to such operating tests as may be required by the Contracting Officer to demonstrate satisfactory functional and operating efficiency. Operating tests shall cover a period of 8 hours for each system, and shall include the following specific information in a report, together with conclusions as to the adequacy of each system.

a. Time, date, and duration of test.

b. Outside and inside dry-bulb temperatures.

c. Water pressure at boiler.

d. Water supply temperature leaving boiler.

e. Water return temperature from system at boiler inlet.

f. Boiler make, type, serial number, design pressure, and rated capacity.

g. Oil-burner make, model, and rated capacity, and ammeter and voltmeter readings for oil-burner motors.

h. Water-circulating-pump make, model, and rated capacity, and ammeter and voltmeter readings for pump motor during operation.

i. Temperature and pressure of fuel oil at burner.

j. Grade of fuel oil used.

k. Fuel-gas temperature at boiler outlet.

l. Percent CO_2 in flue gas.

m. Quantity of hot water circulated.

49

All indicating instruments shall be read at half-hour intervals unless otherwise directed by the Contracting Officer. The report of the test shall be supplied in quadruplicate to the Contracting Officer. The contractor shall furnish all instruments, test equipment, and test personnel that are required for the tests, and the Government will furnish the necessary fuel, water, and electricity.

36-28. CLEANING OF BOILERS AND PIPING. - After the hydrostatic tests have been made and prior to the operating tests, the boilers and piping shall be thoroughly cleaned by filling the system with a solution consisting of either 1 pound of caustic soda or 3 pounds of trisodium phosphate per 100 gallons of water. The water shall be heated to approximately 150 degrees F. and the solution circulated in the system for a period of 48 hours, then drained, and the system thoroughly flushed out with fresh water.

36-29. OPTIONAL CONTROLS. - Pneumatic controls or electronic controls may be provided in lieu of electrical controls.

a. Pneumatic Controls. - Where pneumatic controls are furnished, an air compressor of the standard piston type, complete with tank, valves, gages, filters, and other necessary appurtenances shall be provided. Air lines shall consist of suitable tubing with airtight fittings. The air compressor and tank shall be located as directed by the Contracting Officer. The pneumatic control system shall conform to American Standard B19.

36-30. GUARANTY. - The following equipment to be furnished under this section of the specifications shall be guaranteed as specified in the guaranty paragraph of the SPECIAL CONDITIONS.

Boiler.
Oil-burning equipment.
Automatic-heat-regulating equipment.
Pressure-regulating and relief valves.
Pressure gage and thermometer.
Circulating pump.
Unit heater.

36-31. PAYMENT. - No separate payment will be made for the work covered under this section, and all costs in connection therewith shall be included in the applicable lump-sum contract prices for the structures to which the work pertains.

SECTION 37

WATER SUPPLY WELLS
(Item 99)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
37-01	Scope	37-1
37-02	Applicable Federal Specifications	37-1
37-03	General	37-1
	a. Exploratory Borings	37-1
37-04	Casings	37-1
37-05	Drilling and Testing Wells	37-1
	a. Driving 8-Inch Casing	37-2
	b. Drilling 8-Inch Well	37-2
	c. Installing 6-Inch Casing	37-2
	d. Six-Inch Drilling	37-2
	e. Testing for Plumbness and Alignment	37-2
	f. Pumping and Drawdown Tests	37-3
37-06	Precautions to be Taken	37-4
37-07	Water Analysis	37-5
	a. Form of Analysis	37-5
	b. Sample	37-5
	c. Information With Samples	37-6
37-08	Sterilization	37-6
37-09	Cleaning Up	37-6
37-10	Measurement and Payment	37-6

SECTION 37

WATER SUPPLY WELLS

(Item 99)

37-01. SCOPE. - The work covered by this specification consists of furnishing all labor, tools, equipment, utilities, and materials, and performing all operations for the drilling and testing of deep wells at the locations indicated on the drawings, furnishing chemical and bacteriological analysis of water, complete, in strict accordance with this section of the specifications and the applicable drawings.

37-02. APPLICABLE FEDERAL SPECIFICATIONS. - The following Federal Specifications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification.

WW-P-406a.	Pipe, Steel (Seamless and Welded for Ordinary Uses Iron Pipe Size).
WW-P-441b & Am-1.	Pipe, Wrought Iron (Welded Black or Zinc Coated).

37-03. GENERAL. - It is the intent of this specification that the contractor shall drill a well or wells at the Utility Building and at the Operator's Quarters, as required, to produce a satisfactory potable water supply with a minimum yield of 5 gallons per minute when pumped continuously for 24 hours daily. Wells shall be drilled at the locations shown on the drawings. If the first well at each site does not furnish the required yield, additional well or wells at locations selected by the Contracting Officer shall be drilled. Payment for additional well or wells will be made at the contract unit prices bid for the first well, except that suitable adjustment will be made for mobilization and demobilization items.

a. Exploratory Borings. - Exploratory borings have been made by the Government in the general vicinity of the selected locations of the wells. The location of these borings and the classification of materials encountered are shown on appropriate sheets of the contract plans.

37-04. CASINGS. - The well casings shall be new standard weight wrought iron piping conforming to the applicable requirements of Federal Specification WW-P-441, Class A, except as noted in paragraph 37-05c. Joints in casing pipe shall be welded.

37-05. DRILLING AND TESTING WELLS. - Each well shall be drilled to an approximate depth of 250 feet below the natural surface of the ground; however, if authorized in writing, the well shall be extended to a depth greater than 250 feet but not exceeding 400 feet. A separate payment will be made for this additional work, see Paragraph 37-01e. The right is reserved to stop drilling or testing at any time the Contracting Officer determines that the supply of water is satisfactory or that the yield will be insufficient.

a. Driving 8-Inch Casing. - An 8-inch casing (nominal diameter) shall be driven through overburden and into the bedrock as far as possible, but not more than one foot. At the Utility Building no overburden shall be encountered and at the contractors option the 8-inch casing can be omitted.

b. Drilling 8-Inch Well. - Inside this casing, an 8-inch well shall be drilled approximately 10 feet into the rock.

c. Installing 6-Inch Casing. - A 6-inch casing (nominal diameter) extending from the bottom of the 8-inch well to an elevation 6-inches above ground surface shall be centered within the 8-inch casing and well. The space between the 6-inch casing and rock or 8-inch casing shall be filled with a thin, rich grout to the top of the 8-inch casing. The grout shall be made of quick-setting cement and clean sand and shall be allowed to set for 24 hours before drilling is resumed. The top of the 6-inch casing shall be threaded and a suitable cap shall be supplied and installed. The 8-inch outer casing may be withdrawn at the option of the contractor after placing the grout. If the contractor elects to withdraw the 8-inch casing, standard weight steel pipe, conforming to Federal Specification WW-P-406, may be used instead of wrought iron. If the outer casing is to be left in place, it shall be wrought iron.

d. Six-Inch Drilling. - A 6-inch well shall be drilled below the 6-inch casing a sufficient depth to obtain a satisfactory yield of water. A detailed log of the progress of the drilling of the well shall be kept by the contractor and delivered to the Contracting Officer upon completion of the well drilling operations.

e. Testing for Plumbness and Alignment. - The well shall be constructed, and the casing set, round, plumb, and true to line. To demonstrate the compliance of his work with this requirement, the contractor shall make the tests described herein. Tests for plumbness and alignment shall be made after the complete construction of the well and before its acceptance and in the presence of the Contracting Officer. Additional tests, however, may be made by the contractor during the performance of the drilling. Plumbness and alignment shall be tested by lowering into the well to a depth of 10 feet below the lowest point at which a pump would be set, depending upon the level at which water is found and the probable drawdown, a section of pipe 40 feet long or a dummy of the same length. The outer diameter of the pipe or dummy shall be not more than 1/2-inch smaller than the diameter of that part of the well being tested. If a dummy is used, it shall consist of a rigid spindle with 3 rings, each ring being 12-inches long, and truly cylindrical. The rings shall be spaced, one at each end of the dummy and one in the middle. The central member of the dummy shall be rigid so that it will maintain the alignment of the axis of the rings. Should the test pipe or dummy fail to move freely throughout the length of the casing or well to the above-specified depth, or should the well vary from the vertical in excess of two-thirds the smallest inside diameter of that part of the well being tested per 100-foot depth, or beyond the limitations of this test, the plumbness and alignment of the well shall be corrected by the contractor, and should he fail to correct such faulty alignment or plumbness, the Contracting Officer may refuse to accept the well. The Contracting Officer may waive the requirements of this paragraph as regards plumbness, if in his judgment (a) the contractor has exercised all possible care in constructing the well, and the defect is due to circumstances beyond his control; (b) the utility of the completed well will not be materially affected.

f. Pumping and Drawdown Tests. - If it is necessary, in the opinion of the Contracting Officer, to determine the approximate yield, the well shall be tested by bailing or pumping daily during the drilling period. It is desired to obtain a safe total minimum yield as specified in Paragraph 37-03. When the daily test indicates either that a suitable supply has been obtained or that a sufficient depth has been reached, the well shall be carefully tested for yield and drawdown as specified below. The well shall be tested by pumping continuously for a period of not less than 2 days. During this period, the contractor shall make observations of the drawdown and yield. Samples shall be taken by the contractor for analysis. During the pumping period, the contractor shall keep a complete and detailed log of all observations made and notes as to weather conditions, periods of shutdown, and other pertinent facts. On completion of the test, this pumping log shall be delivered to the Contracting Officer.

(1) Test pumping equipment shall have a maximum capacity of approximately 50 gpm. The pump shall be suitable for deep well pumping. The pump and drive shall be of sturdy construction, reliable in operation and capable of pumping continuously for the duration of the test, except for such brief interruptions as may be required for adjustment, oiling, or fueling. The pump discharge shall have a suitable sampling cock and means for throttling the discharge if desired. Provision shall be made for discharge of water by pipeline at an approved point away from the well, where it will not return to the well. On the day before commencement of the pumping test, the pump and drive shall be given a thorough check-up to insure reliable operation and shall be operated continuously for a period of at least two hours and for such additional time as is needed to determine that the equipment is properly installed and in satisfactory working order. The rate of flow shall be carefully determined by a calibrated end orifice, or by volumetric measurement in an approved manner; if determined by an orifice, the approach conditions shall be suitable. In all cases, adequate means shall be provided for accurate measurement of the head. The depth to water surface shall be accurately measured by means of an electrical contact

device or by the installation of drawdown tubing and air pressure measurement with a calibrated gage.

(2) The test for the well shall be conducted in the following manner.

(a) The static water level shall be noted before pumping is commenced.

(b) The well shall be pumped at a rate of approximately 5 gpm. for six hours, during which time observations shall be made every half hour of the pumping rate and the depth to the water surface in the well.

(c) The well shall be further pumped continuously, for a period of six hours at the rate of 10 gpm. during which time observations shall be made every half hour of the pumping rate and the depth to the water surface in the well.

(d) The pumping rate shall be increased as directed until the maximum yield of the well has been obtained and shall be pumped at the uniform rate as directed and continuously for 48 hours. During this period, observations shall be made every hour of the rate of pumping and depth to the water surface in the well.

(e) Following completion of the pumping period, the contractor shall make observations of the depth to water surface at 15-minute intervals for two hours and then hourly until the water level becomes practically static.

(3) Interruptions required for adjustment of equipment or for minor repairs shall be held to a minimum and shall not total more than 5 percent of the entire test period. If shutdowns or interruptions due to the failure of the contractor's organization or equipment exceed the above-defined limits, and tests are declared a failure for these reasons, the contractor shall perform a new pumping test.

37-06. PRECAUTIONS TO BE TAKEN. - The contractor shall take such precautions as are necessary or as may be required permanently to prevent contaminated water, gasoline or other foreign matter from entering the well either through the opening or by seepage through the ground surface. In the event that the well becomes contaminated or that water having undesirable physical or chemical characteristics does enter the well due to the neglect of the contractor, he shall perform such work or supply such casings, seals, sterilizing agents, or other material as may be necessary to eliminate the contamination or shut off undesirable water.

37-07. WATER ANALYSIS. - After tests have been made concerning the adequacy of the source of water from each well, the contractor shall secure a representative sample of the well water (approximately one gallon) for the chemical analysis and approximately 8 oz. for the bacteriological analysis, and have a complete chemical and bacteriological analysis made by a publicly owned or commercial laboratory sufficiently experienced in performing water analyses to insure reliable results.

a. Form of Analysis. - For purposes of comparison and standardization, the analysis shall be reported in the following form.

Water Analysis

PH Value ____________________
Total Solids ____________________ Parts per million
Calcium as Ca ____________________
Magnesium as Mg ____________________
Sodium and Potassium as Na ________
Iron as Fe ____________________
Silicon as SiO_2 ____________________
Sulphates as SO_4 ____________________
Chlorides as CL ____________________
Nitrates as NO_3 ____________________
Alkalinity (Methyl Orante) as $CaCO_3$ __________
    (Phenolthalein) as $CaCO_3$ __________
Total Hardness as $CaCO_3$ __________ Parts per million
Carbonate Hardness As $CaCO_3$ __________
Non-Carbonate Hardness as $CaCO_3$ ________
Free Carbon Dioxide as CO_2 __________
Salt ____________________
Hydrogen-Sulfide ____________________

b. Sample. - The representative one gallon water sample may be transported in one or more clean glass containers for analysis. The samples shall be labeled with name and location of and identification number of well, date of collection, and name of contractor. The laboratory shall be provided with, in addition to a gallon sample, a small sample (four to eight ounces) for bacteriological analysis. Care shall be taken to see that sample bottles are thoroughly cleaned and the smaller bottle sterilized. A small air space shall be left in the filled bottle to allow for expansion. Samples when collected from well shall be representative of the water in the underground formation and not that which has stood in contact with the well casing or pump. The well pump shall be operated 10 minutes or longer before collecting the samples.

c. Information With Samples. - The following information shall be forwarded with the water samples properly identified with respect to the samples.

(1) Location of well, including county and state, together with distance and direction of nearest town.

(2) Date well was drilled.

(3) Depth and diameter of well and length of casing.

(4) Yield in gallons per minute.

(5) Distances to water level in well, both while idle and while being pumped.

(6) Date and temperature of water when sample was collected.

(7) Description as to the appearance of any suspended matter and color.

(8) Any other information that the laboratory performing the analysis may require.

37-08. STERILIZATION. - The well shall be sterilized prior to acceptance. The disinfecting agent shall be Calcium Hypochlorite or Chlorinated Lime conforming to the requirements of Federal Specification O-C-114a. The quantity of disinfecting agent added to the well shall be sufficient to provide a chlorine residual of 50 parts per million. Following a minimum contact period of 8 hours, the chlorinated water shall be pumped from the well until the chlorine residual is less than 0.2 parts per million. During the contact period, a sufficient amount of the chlorinated water shall be pumped and returned to the well to insure that the walls of the casing have been thoroughly flushed.

37-09. CLEANING UP. - On completion of the work, the contractor shall remove his materials and equipment except as required in subparagraph 37-05f above, clean up debris, and leave the site substantially in the condition in which it was found.

37-10. MEASUREMENT AND PAYMENT. - a. Payment for mobilization of the contractor's equipment and personnel will be made at the applicable contract lump sum prices for "Mobilization and Demobilization for Water Supply Well", which prices shall include all costs in connection with procurement and assembly at the site of the work of all plant, equipment, materials, supplies, and labor required for the prosecution of the work and, upon completion of the work as specified and directed, the cleanup of the work areas, removal of plant, equipment, materials, and supplies from the site of the work.

b. The quantity to be paid for under "Driving 8-Inch Outer Casing" will be the number of linear feet of casing measured from the lower end to the ground surface. Payment will be made at the contract unit price for "Driving 8-Inch Outer Casing" and shall include furnishing and driving the casing and the removal of all materials from the interior thereof down to the surface of the rock.

c. The quantity to be paid for under "Drilling 8-Inch Hole Below 8-Inch Casing" will be the number of linear feet of 8-inch well drilled below the surface of the rock. Payment will be made at the contract unit price for "Drilling 8-Inch Hole Below 8-Inch Casing", and shall include all operations performed in connection with this drilling.

d. The quantity to be paid for under "Setting 6-Inch Inner Casing" will be the actual number of linear feet of 6-inch casing installed. Payment will be made at the contract unit price for "Setting 6-Inch Inner Casing", and shall include furnishing, setting, and grouting the casing in place, including the furnishing of grouting materials.

e. The quantity to be paid for under "Drilling 6-Inch Hole, Uncased", will be the actual number of linear feet of hole so drilled measured from the bottom of the 8-inch hole. Payment will be made at the contract unit price for "Drilling 6-Inch Hole, Uncased", and shall include the performance of all operations in connection with this drilling. In case the contractor is directed to extend the well to a depth greater than 250 feet below ground surface grade, the actual number of linear feet of hole so drilled below the 250-foot level will be measured and paid for under "Drilling 6-Inch Hole, Uncased, Below Depth of 250-Feet". This payment shall include all costs in connection with the drilling operations below 250 feet in depth.

f. The quantity to be paid for under "Test-Pumping Well", will be the actual number of hours of test-pumping measured from beginning to end of the approved pumping period, except that shutdowns of more than one (1) hour, inefficient pumping time, or tests declared a failure, all as determined by the Contracting Officer, will be deducted from the gross time. Payment will be made at the contract price per hour for "Test-Pumping Well", and shall include the performance of all operations in connection with test-pumping, including sterilization and taking samples and securing analyses as specified. Preliminary testing of the pump and calibrating equipment will not be measured for payment.

SECTION 38

WATER AND SEWER SYSTEMS
(Items 100 through 103, incl.)
(Index)

Paragraph No.	Paragraph Title	Page No.
38-01	Scope	38-1
38-02	Excavation, Trenching and Backfilling	38-1
38-03	Water Supply Wells	38-1
38-04	Applicable Specifications	38-1
	a. Federal Specifications	38-1
	b. American Water Works Association Std.	38-2
38-05	Well Chamber	38-2
38-06	Installation of Well Piping	38-3
	a. Drop Piping	38-3
	b. Piping from Well Chamber to Pumps	38-3
	c. Copper Tubing	38-3
	d. Vent Piping	38-3
38-07	Valves	38-3
38-08	Water Storage Tanks	38-3
	a. General	38-3
	b. Gravel Bedding	38-3
	c. Material	38-4
	d. Painting	38-4
	e. Subdrain and Filter Material	38-4
38-09	Well Pumps	38-4
38-10	Sterilization	38-5
38-11	Leaching Trench System	38-5
	a. Distribution Pipe	38-5
	b. Filter Material	38-6
	c. Installation	38-6
38-12	Sewer Lines	38-6
	a. Materials	38-6
	b. Installation	38-6
	c. Joints	38-7

Paragraph No.	Paragraph Title	Page No.
38-13	Septic Tanks	38-7
38-14	Vents and Cleanout	38-8
38-15	Cleanup	38-8
38-16	Payment	38-8

SECTION 38

WATER AND SEWER SYSTEMS
(Items 100 through 103, incl.)

38-01. SCOPE. - The work covered by this section consists of furnishing all plant, labor, materials and equipment, and performing all operations in connection with the installation of the water supply and sanitary sewer systems, at the Operator's Quarters and the Utility Building complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

38-02. EXCAVATION, TRENCHING AND BACKFILLING. - Excavation, trenching and backfilling shall conform to applicable requirements of Section 32.

38-03. WATER SUPPLY WELLS. - Wells are specified and included under Section 37.

38-04. APPLICABLE SPECIFICATIONS. - The following specifications and standards, of the issues listed below but referred to thereafter by basic designation only, form a part of this specification:

a. Federal Specifications. -

0-C-114a	Calcium Hypochlorite, Technical, and Chlorinated Lime, Technical.
0-S-602	Sodium Hypochlorite.
BB-C-120	Chlorine.
QQ-L-156	Lead, Calking.
WW-P-521c	Pipe - Fittings; Malleable Iron and Steel (Screwed) 150 Pound.
WW-P-441b	Pipe; Wrought Iron (Welded, Black or Zinc Coated).
WW-U-531a	Unions; Malleable Iron or Steel.
HH-P-117	Packing; Jute Twisted.
HH-P-119	Packing Material, Sewer Joint, Asphalt Saturated Cellulose-Fiber.
QQ-I-652a	Iron Castings, Gray.
QQ-L-156 & Am-1	Lead; Calking.
SS-B-656	Brick; Building (Common) Clay.
SS-C-192b	Cements, Portland.
SS-P-631b & Am-1	Pipe, Clay Sewer.
SS-P-331a	Pipe Asbestos-Cement, Sewer Non-Pressure.
SS-S-169	Sealer, Joint, Sewer Mineral-Filled, Hot-Pour.
WW-P-401 & Am-3	Pipe and Pipe-Fittings; Soil Cast Iron.

b. American Water Works Association Standard. -

C601-54 Disinfecting Water Mains.

38-05. WELL CHAMBER. - a. General. - The well chambers shall be constructed of brick, concrete or precast concrete rings with frost proof cast iron frame and covers, and in accordance with the drawings. The well chambers shall have cast iron steps of approved design or 7/8 inch diameter wrought iron rungs not less than 10 inches in width built into and thoroughly anchored in the walls and spaced uniformly 15 inches apart with alternate steps or rungs offset 6 inches.

b. Concrete used in the chambers shall conform to requirements of Section 14. Brick shall conform to Federal Specification SS-B-656, hard. Concrete rings shall conform to Federal Specification SS-P-375, except that the length of the sections may be shorter as conditions require, the wall thickness shall be not less than 4 inches for vertical wall sections and not less than 4-3/4 inches for cone sections, and shall be reinforced with not less than 0.12 square inch of steel per foot of wall height. Joints between precast rings shall be fully-bedded in cement mortar and shall be smoothed to a uniform surface on both the interior and exterior of the chamber.

c. Jointing and Plastering. - Mortar for jointing and plastering shall consist of 1 part portland cement and 2 parts fine sand. For brick work, lime may be added to the mortar in the amount of not more than 25 percent of the volume of cement. The joints shall be completely filled and shall be smooth and free from surplus mortar on the inside of the chamber. Brick chambers shall be plastered with 1/2 inch of mortar over the entire outside surface of the walls, and then given a priming coat of asphalt primer and a mop coat of asphalt. Brick shall be laid radially with every sixth course laid as a stretcher course.

d. Frames and Covers. - The frames and covers shall be cast iron of the frost proof design, the inner cover shall be cast iron. The frame and cover shall have a combined weight of not less than 400 pounds and shall conform to Federal Specification QQ-I-652. The letter "W" at least 2-inches high shall be stamped or cast into the covers, so as to be plainly visible. The frames and covers shall be set in a full cement mortar bed and the top of the cover shall be 3 inches higher than the finished or original ground.

e. Water-Level Testing Device, Gage and Valve. - A water-level testing device, consisting of a pipe or tube for insertion between the well casing and pump discharge column shall be provided in each well chamber installation. The pipe or tube shall extend to the bottom of the pump suction pipe, and, shall be tagged or otherwise marked to show its exact length. Each water level testing device shall be furnished with all necessary fittings, a pressure gage calibrated in feet, a check valve, and a hand-operated air pump with the necessary connections. The testing device shall enable measurement of the water level in the well under any condition.

38-06. INSTALLATION OF WELL PIPING. - a. Drop Piping. - The suction and pressure piping within the well casing shall be of wrought iron pipe with the jet setting 5 feet below the pumping level.

b. Piping from Well Chamber to Pumps. - The suction and pressure piping from well chamber to the pump in the heater room of the Utility Bldg. and the pump in the cellar of the Operator's Quarters shall be wrought iron and shall conform to Federal Specification WW-P-441, class A hot-dip zinc-coated, ends threaded and coupling on one end.

(1) Specials and fittings shall be galvanized malleable iron conforming to Federal Specification WW-P-521, type II.

(2) Coating. - Pipe and fittings shall be thoroughly cleaned of foreign matter by wire-brushing and solvent-cleaning, and then given one coat of coal-tar primer and two coats of coal-tar enamel conforming to Military Specification MIL-P-15147C. After installation and testing in final position, coatings where damaged shall be given a hot-applied touchup coat of the specified enamel.

c. Copper Tubing. - The option of copper tubing may be used in the piping from the well chamber to the pumps. Tubing shall conform to Federal Specification WW-T-799, type K annealed. Joints for underground work shall be compression-pattern, flared for soft copper water tubing and shall be made with fittings meeting approved standards. The tubing shall be cut off square and expanded with a proper flaring tool.

d. Vent Piping. - The vent piping from the well chambers to the buildings shall be wrought iron or copper tubing as specified above. The piping shall be securely attached to the buildings and to the heights noted on the Building Plumbing Drawings.

38-07. VALVES. - Gate valves shall be all brass and shall conform to Federal Specification WW-V-54, class B. Globe valves on the well piping pressure and suction lines at the pumps shall be brass and shall conform to Federal Specification WW-V-51A, type I, class B.

38-08. WATER STORAGE TANKS. - a. General. - The contractor shall furnish and install one (1) 10,000 gallon and one (1) 500 gallon buried water storage tank at the locations shown on the drawings. The tanks shall be buried level with earth cover of four (4) feet over the top of the tanks.

b. Gravel Bedding. - Gravel bedding shall be installed around the 10,000 gallon tank to the limits shown on the drawing. The gravel shall be natural sandy gravel or gravelly sand of the components passing the No. 4 U. S. Standard Sieve, not more than 5% by weight shall pass the No. 200 U. S. Standard Sieve. The material shall contain between 10 and 40% by dry weight of particles retained on the No. 4 U. S. Standard Sieve. No stones shall have a maximum dimension of greater than 4 inches.

c. Material. - The tanks shall be the horizontal steel type, welded construction and suitable for underground installation. The shell plates shall be at least 1/4-inch thick and the head plates at least 5/16-inch thick. Both tanks shall be furnished with an 18-inch diameter flanged manhole opening in the top, and with a 2-inch water tight fill pipe and box. The manhole opening on the 10,000 gallon tank shall have a hinged cover and lifting chain. A 36-inch diameter 1/4-inch thick steel access chamber with a metal checked plate cover. Access cover shall be furnished with a hasp and brass padlock.

d. Painting. - After cleaning the tanks the interior surface shall be given a coat of Bitumastic Tank Solution Paint or approved equal. The exterior surfaces shall be given a 1/4-inch thick coating of Bitumastic 70B Enamel conforming to MIL-P-15147C.

e. Subdrain and Filter Material. - In addition to the gravel bedding specified in Subparagraph b, the 10,000 gallon tank shall be provided with a 6-inch subgrade drain and filter material located as shown on the drawing. Subdrain pipe shall be constructed of full diameter standard strength bell and spigot perforated clay pipe. The outlet pipe from the filter material out to grade shall be nonperforated clay pipe. Material and installation shall conform to the paragraph "Sewer lines" of this section of the specifications, except perforations shall be as called for under ASTM Designation C211. The subdrain pipe shall be placed with the perforations down and laid in the pervious material to the dimensions noted on the drawing. Porous filter material around the subdrain shall be 3/4-inch concrete aggregate as specified under Section, CONCRETE.

38-09. WELL PUMPS. - a. The well pumps for the Utility Building and Operator's Quarters shall be of the jet type, two (2) pipe system capable of delivering 300 gallons per hour into a hydropneumatic tank set at 60 psig in the Utility Building and 40 psig in the Operator's Quarters. The pump shall be the centrifugal type with an all bronze impeller, and mechanical shaft seal. The contractor shall not submit a pump for approval until the well has been completed. Depth capacity and drawdown data for the well must be submitted with the pump. However, for bidding purposes the contractor shall base the contract price on a system at both sites with the foot valve located 150 feet below original ground and a maximum drawdown of 100 feet below original ground. Any increase in the cost resulting from changes of the pump setting after the well has been completed will be the subject of an equitable adjustment of the Contract commitment.

b. Motors. - Standard NEMA frame capacitor type jet pump motors, with solid shaft, ball bearing, totally enclosed fan cooled type suitable for operation on 3 phase 120/208 volt 60 cycle current in the Utility Building and single phase 120/240 volt 60 cycle current in the Operator's Quarters, shall be used to operate the well pumps. The motors shall have built-in overload protection.

c. Jet. - The jet shall have an all bronze body, a bronze nozzle and tube and shall have a bronze foot valve and strainer. Piping within the wells shall be wrought iron, piping from the well chambers to the pumps shall be wrought iron or copper tubing as specified herein for "Installation of Well Piping".

d. Well Cap. - A sanitary well cap shall be provided to support the vertical pipes in the well. An opening shall be provided in the well cap for the water level testing device specified herein for "Well Chamber".

e. Installation of Equipment. - The contractor shall install the above equipment as shown, or specified so the pumps will start when the pressure is 40 psig and stop when the pressure is 60 psig for the Utility Building and start when the pressure is 20 psig and stop when the pressure is 40 psig at the Operator's Quarters. After the installation has been completed the contractor shall apply a hydrostatic pressure of 75 pounds to the entire system from the well through the hydropneumatic tank for two (2) hours duration. During the test the contractor shall measure the capacities at the available suction heads and the pressures on the suction and discharge side of the pumps and shall deliver all test data to the Contracting Officer.

38-10. STERILIZATION. - The pumps and the connecting lines thereto shall be thoroughly disinfected with chlorine before being placed in operation. The amount of chlorine applied shall be such as to provide a dosage of not less than 50 parts per million. The chlorinating material shall be introduced into the system, and allowed a contact period of not less than eight (8) hours, the heavily chlorinated water shall be flushed from the system with clean water until the residual chlorine content is not greater than two-tenths parts per million. All valves in water lines being disinfected shall be opened and closed several times during the 18 hour period. The contractor may use either of the following materials;

Calcium Hypochlorite and Chlorinated Lime conforming to requirements of Federal Specification 0-C-114.

Sodium Hypochlorite conforming to requirements of Federal Specification 0-S-602.

38-11. LEACHING TRENCH SYSTEM. - The leaching trench system shall be constructed in accordance with the details shown on the drawings. All work, including stripping and excavation, shall be performed in a manner to avoid intermixing the top layers of soil with the underlying materials and thus creating a more impervious base upon which the leaching trench will be constructed.

a. Distribution Pipe. - Distribution pipe in the leaching trenches is designed to spread the sewage over the area of the leaching trench. In order to accomplish this purpose, care must be exercised in placing the pipe exactly as shown on the drawings. Leaching trenches shall be dug to the dimensions shown on the drawings, and with the sides of the trenches as nearly vertical as possible.

b. Filter Material. - Filter material shall be washed and screened gravel obtained from commercial source and shall be composed of hard, tough durable particles, free from adherent coating and shall not contain vegetable matter, nor soft, friable, thin or elongated particles. The gradation of the material shall meet with the approval of the Contracting Officer and shall be within the following gradation range:

U. S. Standard Sieve Size	Percent Passing by Weight
1"	100
3/4"	85-100
3/8"	70-80
No. 4	40-70
No. 10	20-50
No. 40	0-15
No. 65	0-5

c. Installation. - The six inch clay bell-and-spigot pipe shall be open joint pipe as called for on the drawings. Open joints shall be 3/8-inch held in alignment by approved wooden spacers left in place in the bell and shall have a piece of 30-pound roofing felt 4 inches wide laid over the top half of the joint. After backfilling trenches with filter material to the depths shown, the balance of the trench shall be backfilled with earth fill lightly tamped by hand.

38-12. SEWER LINES. - a. Materials. - The sewer lines from five feet outside the Utility Building and Operator's Quarters to the inlet of the septic tanks and from the outlet of the septic tanks to the beginning of the leaching trench systems shall be vitrified clay, bell-and-spigot pipe and fittings, standard strength deep and wide socket pipe conforming to Federal Specification SS-P-361b. All pipe will be inspected upon delivery and such as does not conform to the requirements of the contract shall be rejected and must be removed by the contractor. The contractor shall furnish all labor necessary to assist the inspector in inspecting the material. At the option of the contractor, asbestos cement pipe conforming to Federal Specification SS-P-331a, Class 1, may be used in lieu of clay pipe for sewer lines.

b. Installation. - Pipe of the required size shall be laid to conform to the lines and grades shown on the drawings or as established by the Contracting Officer. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and bring the inverts continuously to the required grade. The bottoms of pipe trenches shall be shaped to give full support to the lower quadrant of each pipe, so that the pipes shall have a continuous and even bearing and equally distributed pressure

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

PLANS FOR THE

CONSTRUCTION OF DAM

AND

APPURTENANT STRUCTURES

U.S. Army Engineer Division, New England
Corps of Engineers Waltham, Mass.

MARCH 1962

All drawings in this folio have been reduced to one half the original scale.

upon them. Suitable bell holes shall be dug about pipe bells to provide ample space for making tight joints. All bends and connections shall be made with commercially manufactured branches and fittings. Open ends of pipe and branches shall be sealed with vitrified clay stoppers secured in place in an acceptable manner using a suitable gasket between the stopper and the socket. In no case shall water be allowed to rise in or about the pipe before the joint has become thoroughly set. Walking on or working over the pipes after they are laid will not be permitted until they are covered with earth to a depth of 12 inches except as may be necessary in tamping the earth and backfilling. All openings to the pipe line shall be satisfactorily protected to prevent the entrance of earth or other material.

c. Joints. - Bell-and-spigot joints shall be made with bituminous joint compound unless otherwise specified. The compound shall be heated to the proper temperature to permit rapid pouring and to obtain a strong adhesion of the compound to the pipe. The temperature of the molten compound shall be between 350 degrees F. and 450 degrees F. unless otherwise recommended by the manufacturer. The pipe shall be centered so that the annular space is uniform. The annular space shall then be well calked with jute or oakum. The depth of the packing shall be such as to leave a space or at least one (1) inch measured from the end of the bell. When the jointing is made with the pipe in its final location a suitable joint runner, dipped into thick mud or grout to permit easy removal when the joint has cooled shall be placed around the pipe, leaving an opening at the top of the runner. The molten compound shall be poured continuously into the opening until the joint is filled and as rapidly as possible without entrapping air. After the compound has cooled, the runner may be removed. Alternate joints may be poured before the pipe is lowered, in which case the joint shall be poured with the pipe in vertical position without the use of the runner. The compound shall have thoroughly set before the pipe is placed in the trench and the pipe shall be handled without deforming the joint.

38-13. SEPTIC TANKS. - a. Material. - The septic tank for the Utility Building shall have a minimum working capacity of 1250 gallons, and for the Operator's Quarters a minimum working capacity of 800 gallons. Tank shall be fabricated of 12 gage steel and coated inside and out with a bituminous material applied hot as standard with the manufacturer. The tanks shall be of the horizontal type and be equipped with two (2) access manholes, a minimum of 16 inches in diameter over the inlet and outlet baffle plates. Access chimneys shall be secured to the tanks and extended up to grade and shall be provided with solid removable covers. The tanks shall be installed in a level position on a 12-inch gravel bedding as specified under water storage tanks. Shop drawings shall be submitted for approval.

b. Precast-reinforced concrete tanks may be used in lieu of the steel tanks. If this option is exercised the contractor shall submit detail drawings of the proposed tanks and shall receive approval of such drawings prior to start of work on this item. Concrete shall meet a 4000 p.s.i. test. Installation shall be as specified for steel tanks above.

38-14. VENTS AND CLEANOUT. - The cleanout shall be connected to the 6-inch V.C. sewer line by means of a 6" C.I. soil pipe wye branch and extended 6 in. above grade with 6" C.I. soil pipe. Vents on the leaching trench system shall be connected to the 6" V.C. pipe by means of a 6" C.I. soil pipe tee and extended to 6 in. above grade with 6" C.I. soil pipe. The bell of the open pipe above grade shall be fitted with a C.I. grate on the vent pipes and C.I. solid cover for the cleanout. Cast iron soil pipe shall conform to the applicable paragraph in the section on "Plumbing" and shall be extra heavy weight pipe.

38-15. CLEANUP. - Upon completion of the installation of the water and sewer systems, well chambers, water storage tanks and appurtenances, all debris and surplus materials resulting from the work shall be removed.

38-16. PAYMENT. - a. Payment for all work specified in this section (except otherwise specified) will be included in the following lump sum prices for the various features of work. The tank at the Flood Control Gate Shaft will be included for payment purposes under the lump sum price for Item No. 100, "Water Distribution System - Utility Building Area."

b. All work relative to water distribution systems including the well pumps, and piping thereto from the well chambers will be included in the applicable lump sum contract prices for Items Nos. 100 and 101, "Water Distribution System."

c. All work relative to the sewage disposal system, will be included in the applicable lump sum contract prices for Items Nos. 102 and 103, "Sewage Disposal System."

d. The vent pipe and the suction line from the 500 gallon tank to the gate shaft structure will be included under the lump sum contract price for Item 68, "Flood Control Gate Shaft - Miscellaneous."

e. The above lump sum contract prices shall include all costs in connection with excavation (except rock), filling and backfilling.

SECTION 40

PAINTING

(INDEX)

Paragraph No.	Paragraph Title	Page No.
40-01	General	40-1
	a. Scope	40-1
	b. Requirements	40-1
	c. Definitions and Nomenclature	40-1
	d. Standard Specifications	40-2
	e. Samples and Tests	40-2
	f. Payment	40-3
40-02	Cleaning and Preparation of Surfaces	40-3
	a. General	40-3
	b. Cleaning and Preparation of Ferrous Surfaces	40-3
	c. Cleaning of Galvanized Surfaces	40-5
	d. Wood Surfaces	40-5
	e. Surface Preparation of Plaster Surfaces	40-6
	f. Fabric Covering	40-6
40-03	Paint Application	40-7
	a. General	40-7
	b. Paint Properties, Labeling, Storage, Mixing, and Thinning	40-7
	c. Atmospheric Conditions	40-8
	d. Protection of Paint Surfaces	40-8
	e. Contacting Surfaces	40-9
	f. Time Between Surface Preparation and Painting	40-9
	g. Method of Paint Application	40-9
	h. Coating Progress	40-9
	i. Drying Time Prior to Immersion	40-10
	j. Coverage and Film Thickness	40-10
	k. Direction for Application of Vinyl Type Paints	40-10
40-04	Paints to be Applied - Number of Coats and Formulas	40-11
	a. General	40-11
	b. Painting Schedule (Exterior and Interior Surfaces	

Paragraph No.	Paragraph Title	Page No.
40-05	Special Paint Formulations Not Covered By Standard Specifications	40-21
	a. Exceptions	40-21
	b. General	40-21
	c. Inspection and Tests	40-21
	d. Packaging and Labeling	40-21
	e. Colors and Tints	40-21
	f. Paint Formulations	40-22
	g. Ingredient Materials	40-23

SECTION 40

PAINTING

40-01. GENERAL. - a. Scope. - (1) The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with preparation of surfaces, application of all paint or other materials, and the manufacture of paints, paint materials, and miscellaneous materials incidental thereto, (except as otherwise stated) complete in strict accordance with the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

(2) Surfaces to be painted shall receive the treatment and number of coats prescribed in the painting schedule.

b. Requirements. - No paint under this section will be applied to the following materials:

(1) Metal surfaces that are to be encased or embedded in concrete.

(2) Galvanized iron including wrought-iron railings and steel (except as specifically stated).

(3) Copper, brass, bronze, or plated work.

(4) Aluminum surfaces.

(5) Concrete surfaces.

(6) Factory finished items.

(7) Corrosion resisting steel.

(8) Items included to be painted under other sections.

c. Definitions and Nomenclature. - (1) Paint. - The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, organic or inorganic, whether they be used as prime, intermediate, or finish coats. This definition does not include troweled or metal-sprayed coatings.

(2) Shop Painting. - The term "shop painting", as referred to herein and/or on the drawings, covers operations conducted on painting material or equipment in a shop or plant before shipment to the site of erection or installation.

(3) Field Painting. - The term "field painting", as referred to herein and/or on the drawings, covers the application of paint coats at the construction site.

(4) New surfaces refers to unpainted surfaces of newly fabricated structures and items which are to receive paint coats.

(5) Touch-up painting refers to the application of paint on small areas of painted surfaces to repair mars and scratches and to restore the coating to an unbroken condition.

(6) Repainting designates the cleaning and recoating of extensive areas on which the existing coatings have deteriorated or otherwise do not provide adequate surface protection.

(7) Blast cleaning designates the cleaning of surfaces by forceful impingement of abrasive particles thereon by air blast or centrifugal action and includes sandblasting and gritblasting.

d. Standard Specifications. - Materials specified herein to meet the requirements of standard specifications published by national authorities shall conform with the issue in effect on the date of invitation for bids. National authorities publishing standard specifications referred to herein with the abbreviations used are as follows.

Agency	Abbreviation
Office of Standardization, Dept. of Defense	MIL or JAN
General Service Administration	Fed. Spec.
American Society for Testing Materials	ASTM Spec.
American Waterworks Association	AWWA Spec.

e. Samples and Tests. - One-quart samples of each batch of each type and color of paint proposed for use shall be submitted to the Contracting Officer and approval thereof received before the material represented by the sample is used on the project. Where specifically indicated herein or where indicated in a Standard Specification for a finished paint product, separate samples of ingredient materials will be required. The ingredient samples when furnished shall be clearly identified by commercial name, trade designation, batch number and such other data as may be deemed necessary. Sampling at the paint factory under proper supervision will be permitted. In addition to furnishing samples, the contractor shall submit certified reports of tests thereof to the Contracting Officer, indicating compliance with the specifications.

f. Payment. - Payment for all work performed and for all materials furnished under this section of the specifications will be included in the contract prices for the items on which the work is performed, and to which the materials are applied.

40-02. CLEANING AND PREPARATION OF SURFACES. - a. General. - Surfaces to be painted shall be clean before applying paint or surface treatments. The removal of oil and grease shall, in general, be accomplished with mineral spirits or other low-toxicity solvents having a flash point above 100° F. before mechanical cleaning is started. Solvent cleaning shall be done with clean cloths and clean fluids to avoid leaving a thin film of greasy residue on the surfaces being cleaned. Where blast cleaning is used, minor amounts of grease and oil contaminants need not be removed with solvents provided the abrasive is not reclaimed and reused and provided the blast cleaning process, by itself, leaves the surfaces completely free of grease and oil. Cleaning and painting shall be so programmed that dust or other contaminants from the cleaning process do not fall on wet, newly painted surfaces. Surfaces not intended to be painted shall be suitably protected from the effects of cleaning and painting operations. Fabricated, assembled items which are normally cleaned and painted in the shop in accordance with the manufacturer's standard practice will be considered for exemption from the detailed cleaning and painting requirements set forth herein, upon specific request of the contractor. Machine-finished and other bare metal surfaces, which are not to be painted, but which will require temporary protection during construction, shall be treated with rust-preventive compound conforming to MIL Spec. MIL-C-16173A, Grade I, unless otherwise specifically indicated. Removable equipment adjacent to surfaces to be painted shall, if necessary, be disconnected and moved to permit cleaning and painting of said surfaces, and replaced by workmen skilled in the trades involved.

b. Cleaning and Preparation of Ferrous Surfaces. - (1) Surfaces in Exterior or Interior Atmospheric Exposure. - Ferrous surfaces which will be completely and continuously in normal exterior or interior atmospheric exposure (see schedule) shall be cleaned in the shop or place of manufacture. Grease, dirt, and other soiling substances shall be removed by means of emulsions, steam, solvents, and/or other approved methods. Rust and loose mill scale shall be removed by high-speed power brushing, scraping, chipping, disc-sanding, or other approved means. Preparation of surfaces by blasting to at least the degree of surface cleanliness indicated for the other methods of mechanical cleaning may be used at the option of the contractor. The use of chipping tools with action so severe as to produce cuts, burrs and other forms of excessive surface roughness will not be permitted. "Tight" mill scale, i.e., that which cannot be lifted by applying a sharp knife to any edge, will be permitted. Minor amounts of residual rust, not removable except by thorough blast cleaning, will be permitted but stratified rust (scale) shall be removed in any event. Welds and adjacent surfaces to the extent affected by welding shall be given special treatment by scraping, chipping, and wire brushing to insure that flux, slag and weld spatter are removed. Following mechanical cleaning, the weld and adjacent surfaces shall be treated with a phosphoric acid solution conforming to Military Specification MIL-M-10578B, Type II, diluted in the proportion of 1 volume of base material to 4 parts of clean water. The diluted material shall be applied by brush or sponge and allowed to remain one-half minute or longer, followed by thorough wiping with clean wet rags. Surfaces shall be primed in the shop as soon as practicable after cleaning with the linseed oil type primer specified for atmospheric exposed steel. (See schedule). Weathering of fabricated, unpainted steel for any purpose will not be permitted unless the surfaces are subsequently to be blast cleaned of all mill scale and rust to base metal. Prior to applying subsequent coats, all welds and other damaged areas of shop-primed surfaces shall be field cleaned and reprimed as previously specified.

(2) Cleaning and Pretreatment of Ferrous Surfaces in Underwater Exposure. - Surfaces of structural components which will be subject to extended periods of immersion or otherwise as required (see schedule) shall be cleaned of all rust, mill scale and other foreign matter to base metal by dry blast cleaning. Blast cleaning shall be done in the field after erection unless specifically authorized otherwise by the Contracting Officer. Surfaces to be coated which will not be accessible after erection shall be cleaned and painted before becoming inaccessible. The cleaned surfaces shall be of a uniform gray-white metallic color, completely free of mill scale, rust, oxide, paint, welding slag, weld spatter or other foreign material. Where necessary, power tools shall be used in conjunction with blast cleaning to effect the removal of weld spatter and heavy, stratified rust scale. Blast cleaning shall be accomplished with sand, crushed iron or steel grit or synthetic nonmetallic grit of such particle shape, hardness and gradation as to effectively clean the metal and leave a roughened surface suitable for tenacious adhesion of subsequent coatings. The maximum particle size of any type of abrasive shall be no larger than that passing a No. 16 mesh screen, U. S. sieve series. Nonmetallic abrasives shall be dustfree and no more than 10% shall pass a No. 50 mesh sieve. The contractor shall take all precautions to prevent damage to machinery and surfaces not requiring blast cleaning and to prevent dust from settling into any adjacent films of wet paint. As soon after cleaning as practicable and prior to the formation of any detectable condensation or corrosion, all blast-cleaned ferrous surfaces shall be cleaned of dust and abrasive particles by brushing, vacuum and/or blow-down with clean, dry compressed air, and given the first coat of paint including any pretreatment, required by the schedule. In no event, shall blast-cleaned surfaces stand

overnight without having received the specified pretreatment and/or the first coat of paint prescribed by the schedule. Structural features or components, such as which make up a single integral surface and which are subject in part to atmospheric exposure and in part to immersion in water, shall be prepared and painted as though the entire component were subject to immersion. Surfaces requiring complete removal of mill scale shall be cleaned in the field, except that upon written request by the contractor, the Contracting Officer may authorize mill or shop cleaning of assembled or partially assembled components specified to receive a vinyl type paint system. The surfaces, if shop-cleaned, shall be blasted, pretreated if required, and coated with the paint specified in the schedule for the first coat. The dry film thickness of the shop-applied coating shall be 2.0 to 2.5 mils, irrespective of the number of passes or coats required to achieve this thickness. This pre-erection or construction period coating shall be maintained in good condition by recleaning and touching up any areas damaged during the construction period. Prior to the field application of subsequent coats to obtain the prescribed total film thickness, soiled areas of the pre-erection coating shall be thoroughly cleaned with mineral spirits and all welds or other unpainted or damaged areas shall be cleaned and primed in such a manner as to make them equivalent to adjacent, undamaged paint surfaces.

c. Cleaning of Galvanized Surfaces. - Unless otherwise specifically provided, galvanized surfaces shall not be painted. Where such surfaces are specified to be painted, they shall be first washed with clean mineral spirits and then coated by spray, swab or brush with vinyl type wash coat conforming to MIL Spec. MIL-P-15328B (see specific directions for application of vinyl type coatings) preparatory to receiving the specified paint coats.

d. Wood Surfaces. - (1) Wood surfaces, except surfaces to be given natural finish, shall be primed and finish-coated as specified in the painting schedule herein. Open grained woods to be painted, such as oak or mahogany, shall be treated with wood filler prior to priming and prepared for painting as hereinafter specified. Wood surfaces to be painted shall be cleaned of all dirt, oil, or other foreign substances with mineral spirits, scrapers, sandpaper, and/or wirebrush. Finished surfaces exposed to view shall be made smooth by sandpapering. All exterior woodwork, including millwork, exterior siding, and wood members that will be in contact with masonry, shall be given a coat of the specified first-coat material on all sides and edges before installation. The built-in surfaces of window sills shall be double-primed. Glazing rabbets and beads in exterior sash and doors shall be double-primed prior to glazing. Parting strips of wood double-hung windows shall be treated with two coats of boiled linseed oil. Edges of doors that have been trimmed during hanging and fitting shall be given a coat of the specified first-coat material. Small, dry, seasoned knots shall be surface scraped and thoroughly cleaned, and shall be given a thin coat of knot sealer conforming to Military Specification MIL-S-12935 before application of the priming coat. Pitch on large, open, unseasoned knots and all other beads or streaks of pitch shall be scraped off, or if still soft, shall be removed with mineral spirits or turpentine and the resinous area thinly coated with knot sealer. After priming, all holes and imperfections in finish surfaces shall be filled with putty or plastic wood-filler colored to match the finish coat, allowed to dry, and sandpapered smooth. Unless otherwise authorized, painting shall proceed only when the moisture content of the wood does not exceed 12 percent as measured by a moisture meter. Painting of exterior wood siding shall proceed, insofar as is practicable, only after interior masonry work has dried.

(2) Interior wood surfaces to receive natural finish, except as hereinafter specified, shall be stained to the approved shade and lightly sanded. Oak and other open-grain wood shall be given the same treatment and, in addition, shall be given a coat of paste wood filler not less than 8 hours after the application of stain. Excess filler shall be removed and the surface then sanded smooth. Each varnish coat shall be lightly sanded prior to application of subsequent coat.

(3) Interior wood floors shall be well sanded with a power sanding machine before finishing, working in the direction of the grain of the wood as far as possible. No. 3 sandpaper shall be used for the first rough sanding followed by No. 1-1/2-sandpaper and finally by No. 0 sandpaper. No traffic will be permitted on the floor between the last sanding and application of the finish. Oak and similar open-grained woods shall be filled with wood filler and all excess filler removed. Each coat of sealer applied to floors shall be power buffed with fine steel wool to remove raised grain and excess sealer. Final coat of sealer shall be allowed to dry one week before waxing.

e. Surface Preparation of Plaster Surfaces. - Prior to painting, care shall be taken to insure that plaster surfaces are thoroughly dry and clean and free from grit, loose plaster, and surface irregularities. Cracks and holes shall be repaired with approved patching materials, properly keyed to the existing surfaces and sandpapered smooth. Plaster shall be permitted to age the minimum number of days prescribed in the schedule before application of the first coat of paint.

f. Fabric Covering. - Fabric covering over insulation on pipes, ducts, and other equipment shall be given a heavy coat of nonpenetrating size to which subsequent paint coats will permanently adhere. The size shall be applied in such manner as to completely seal the surface. A sufficient amount of fungicidal agent shall be added to the size and each finish coat of paint thereafter to render the fabric mildewproof. The fungicidal agent shall be of a type that will not adversely affect the color, texture, or durability of the paint or size. One percent of one of the phenol mercuric compounds or 4 percent tetrachlorophenol is acceptable for oil-base materials. Four percent sodium tetrachlorophenate is acceptable for water-emulsion paints and sizes. Percentages are based on the nonvolatile vehicle content of the paint.

40-03. PAINT APPLICATION. - a. General. - All work shall be done in a workmanlike manner, so that the finished coating will be free from holidays, pinholes, bubbles, runs, drops, ridges, waves, laps, unnecessary brush marks and variations in color, texture, and gloss. All coats shall be applied in such manner as to produce an even film of uniform thickness. Edges, corners, crevices, seams, joints, welds, rivets, and other surface irregularities shall receive special attention to insure that they receive an adequate thickness of paint. Care shall be exercised during spraying to hold the nozzle perpendicular to and sufficiently close to the surfaces being painted to avoid loss of material into the air, or the bridging over of crevices and corners. Spray equipment shall be equipped with traps, separators, mechanical agitators, pressure gages and pressure regulators. Aircaps, nozzles, and needles shall be as recommended by the spray equipment manufacturer for the material being applied. Spray painting shall be supplemented by brushing or other means where necessary to properly coat crevices, pockets, interior angles and all other surfaces which cannot be satisfactorily coated by spray. Respirators shall be worn by all persons engaged or assisting in spray painting.

b. Paint Properties, Labeling, Storage, Mixing, and Thinning. - All paint, when applied, shall provide a satisfactory film and a smooth, even surface. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints shall be thoroughly stirred, strained and kept at a uniform consistency during application. Paste pigments, specified to be added at the time of use, shall be mixed as follows: place the pigment in a separate container and add small increments of the required vehicle or base paint, with thorough stirring, until a viscous, smooth, homogeneous lump-free mixture is obtained. Mix in the remainder of the vehicle or base paint by boxing and stirring. Powdered metallic pigments, added at the time of use, shall be mixed by adding the powder in small increments to about one-third of the required base paint or vehicle, with thorough mixing to obtain a smooth mixture. The remainder of the vehicle or base paint shall then be thoroughly stirred in. Where necessary, in the opinion of the inspector, to suit conditions of surface, temperature, weather, and method of application, the packaged paint may be thinned immediately prior to use by the addition of not more than one pint per gallon of the proper thinner provided that in no case shall the paint be reduced more than is absolutely necessary to obtain the proper application characteristics. Vinyl paints may be thinned more than the maximum indicated above (see specific directions for applying vinyl type paints). Paint shall be delivered to the job in unbroken containers which shall show the designated name, formula, or specification number, color, batch number, any special directions, manufacturer and date of manufacture, all of which shall be plainly legible at the time of use. Paints which can be harmed by exposure to cold weather shall be stored in heated shelters. During application, the paint in the spray tank or other working container shall be not less than 50° F.

c. Atmospheric Conditions. - Except as specified or required for certain water-thinned paints, paints shall be applied only to surfaces which are completely free of moisture as determined by sight or touch. In no case shall any paint be applied to surfaces upon which there is visible frost or ice. While painting is being done, the temperature of the surfaces to be painted and of atmosphere in contact therewith, shall be maintained at or above 45° F., except that in no event shall latex type (water-thinned) paints be applied at air and surface temperatures which are low enough to detrimentally affect the formation and character of the dried film. Where paints are being used which dry solely by evaporation of organic solvent, such as the vinyl type paints, the temperature of air and surface may be 35° F., or as approved by the Contracting Officer. During periods of inclement weather, painting may be continued by inclosing the surfaces with temporary shelters and applying artificial heat, provided the minimum air, surface, and paint temperatures prescribed above are maintained. Paint shall not be applied to surfaces which are hot enough to cause blistering or pinholing of the film.

d. Protection of Paint Surfaces. - Where shelter and/or heat are provided for paint surfaces during inclement weather, such protective measures shall be maintained until the paint film has dried, and/or discontinuance of the measures is authorized. Items which have been painted shall not be handled, worked on or otherwise disturbed until the paint coat is completely dry and hard. After delivery at the site of permanent erection or installation, all shop-coated metalwork shall be stored out of contact with the ground in such a manner as will minimize the formation of water-holding pockets and in such a location as will minimize soiling, contamination and deterioration of the paint film. Shop-coated metal shall be repainted or retouched from time to time with the specified paint, whenever in the opinion of the Contracting Officer it becomes necessary to maintain the integrity of the film.

e. Contacting Surfaces. - When riveted or bolted contact is to exist between surfaces of ferrous or other metal parts of substantially similar chemical composition, such surfaces will not be required to be painted. Contacting surfaces formed by high-strength bolt connections shall not be painted. Where an electrical potential is apt to exist between metal surfaces of unlike chemical composition in riveted or bolted contact, each of the contacting surfaces shall be cleaned, pretreated, and given one coat of primer, all as specified for the particular metals involved. Where a nonmetal surface is to be in riveted or bolted contact with a metal surface, the contacting surfaces of the metal shall be cleaned, pretreated if required, and given three coats of the specified primer.

f. Time Between Surface Preparation and Painting. - Surfaces which have been cleaned and/or otherwise prepared for painting shall be primed as soon as practicable after such preparation has been completed, but in any event, prior to any deterioration of the prepared surface.

g. Method of Paint Application. - Unless otherwise specifically directed or authorized by the Contracting Officer, the first coat on surfaces of plaster, or other nonmetallic items shall be applied by brush or roller provided that the latter method, in the opinion of the Contracting Officer, furnishes a coating equal to brush application in appearance, uniformity and other respects. Subsequent coats may be applied by roller, spray, or brush. The specified first coat of paint shall be applied by brush to ferrous surfaces which have not been blast-cleaned but may be applied by spray or brush, except as otherwise specified, to surfaces which have been blast-cleaned. All subsequent coats for all ferrous surfaces may, unless otherwise specified, be either brush or spray applied. All coats for nonferrous metal surfaces may be brushed or sprayed. Whenever spraying of a surface is permitted or directed, it is to be understood that all areas inaccessible to spray painting shall be coated by brushing or other suitable means.

h. Coating Progress. - Where field painting on any type of surface has commenced on any portion of the work, the complete painting operation, including priming and finishing coats, on that portion of the work, shall be completed as soon as practicable, without prolonged delays. Sufficient time shall elapse between successive coats to permit them to dry properly for recoating and this minimum drying period shall be modified as necessary to suit adverse weather conditions. Paint shall be considered dry for recoating when it feels firm and does not deform or feel sticky under moderate pressure of the finger. The application of another coat of paint shall not cause such film irregularities as lifting or loss of adhesion of the undercoat and the undercoat shall have dried sufficiently so as not to retard the drying of the next coat. At all times prior to final acceptance of the work, all coats of all painted surfaces shall be unscarred and completely integral at the time of application of all succeeding coats. At the time of application of each successive coat, undercoats shall be cleaned of dust, grease, or any foreign matter, which might adversely affect intercoat adhesion, by means of air blast, solvent cleaning or other approved means. Enamel undercoats of high gloss shall be scuff-sanded prior to application of a succeeding coat. Field coats on metal shall be applied after erection except as otherwise specified and excepting surfaces to be painted which will become inaccessible after erection.

i. Drying Time Prior to Immersion. - Vinyl type paint systems shall be allowed a final dry as long as practicable, but painted surfaces shall not be immersed in water with less than 72 hours drying of the last coat.

j. Coverage and Film Thickness. - The actual surface area covered per gallon of paint shall not exceed the spreading rates prescribed in the schedule. Where no spreading rate is specified, the paint shall be applied at a rate normal for the type of material being used. In any event, the combined coats of a specified paint system shall completely hide the base surface. Where dry film thickness requirements are specified for ferrous surfaces, the measurements shall be made with a General Electric, Type B, film thickness gage, calibrated on metal identical in composition, thickness, and surface preparation to the item being coated. Sufficient measurements shall be made to accurately establish average thicknesses.

k. Direction for Application of Vinyl Type Paints. - (1) Vinyl Type Wash Coat (conforming to MIL Spec. MIL-P-15328B) shall be mixed by adding 1 volume of acid component (diluent) to 4 volumes of resin component (base solution). The acid component shall be added slowly and with constant stirring. After mixing, the wash coat shall be used within 8 hours and any mixed material older than 8 hours shall be disposed of or removed from the job. The wash coat shall be spray applied at a coverage rate of 250 to 300 square feet per gallon of resin component to give a dry film thickness of 0.3 to 0.5 mils. Small areas may be wash-coated by brush or swab. Care shall be exercised in spray application to avoid the deposition of dry particles on the surface. A wet spray shall be maintained at all times by additional thinning with Normal Butanol or 99 percent Isopropanol where required by prevailing weather conditions. The acid component (diluent), over and above the amount prescribed above, shall not be used for thinning purposes. Surfaces treated with the wash coat shall receive the first coat of paint after at least one hour of drying for the wash coat, and within 24 hours after the wash coat treatment.

(2) Vinyl paints other than the vinyl type wash coat shall be spray applied, except that minor areas inaccessible to spraying shall be brushed. The vinyl paint as received shall be thinned 20 to 35 percent by volume, with T-10 thinner (90 percent toluene and 10 percent methyl isobutyl ketone). The use of other thinners will not be allowed. The amount of thinner shall be varied to suit prevailing weather conditions but shall at all times be sufficient to provide a wet spray and avoid deposition of particles which are dry when they strike the surface. Each coat required by the schedule shall consist of a preliminary , extra spray pass on edges, corners, interior angles, seams, crevices, junctions of joining members, rivet lines, weld lines and similar surface irregularities, followed by an over-all double spray coat, applied at a coverage rate of approximately 130 square feet per gallon of unthinned paint but in any event, sufficient to obtain an average dry film thickness of 1.25 to 1.75 mils. Where impracticable, because of weather conditions or other reasons, to obtain this film thickness, additional applications, at no additional cost to the Government, shall be made so that the prescribed film thickness for each type of paint used in the system is obtained. A double spray coat shall consist of giving a sizeable area of several hundred square feet a fairly thin coat of paint in one pass and then going over it again in a few minutes with a heavy, wet coat, applied just short of sagging in order to build up the prescribed film thickness. Particular care shall be exercised to insure that the spray nozzle is held close enough to the surface to avoid excessive loss of volatile material in the spraying process. The spray nozzle shall, at all times, be perpendicular to the surface being coated. Rivets and similar surface projections shall receive sprayed paint from every direction in order to insure complete coverage of all faces. Pits, cracks, and crevices shall be filled with paint insofar as practicable. Fluid and atomization pressure shall be kept as low as practicable consistent with good spraying results. Alternate passes of the spray shall be at right angles to the preceding pass. Hot spray application of vinyl type paints, except vinyl wash coat, will be permitted. Undercoats shall be permitted to dry at least two hours before recoating, but not more than 2 double spray coats shall be applied in one 8-hour day. Where vinyl paints are used in enclosed spaces, an adequate ventilating system shall be provided, plans for which shall be approved by the Contracting Officer.

40-04. PAINTS TO BE APPLIED - NUMBER OF COATS AND FORMULAS. - a. General. - The surface preparation and paints required for various types of surface and exposure are shown in subparagraph b, below. Supplementary information for use with the schedule follows.

(1) Fabricated and assembled items which are normally painted in accordance with the manufacturer's standard practice except

ferrous surfaces subject to immersion and abrasion in water may be exempted from the following schedule requirements for surface preparation and painting, on specific request by the contractor and approval by the Contracting Officer. Mars and scratches on surfaces painted in accordance with the manufacturer's standard practice shall be touched-up in the field to provide an appearance satisfactory to the Contracting Officer.

(2) Colors and Tints shall match the respective color specimens designated by, or shall otherwise be subject to the approval of the Contracting Officer. Where so directed by the Contracting Officer, alternate coats of paints having the same color shall be tinted with small amounts of ultramarine blue or lamp black or other approved ingredients, ground in a vehicle compatible with the paint being tinted, in order to insure that all surfaces are properly coated with the specified number of paint coats. Tinting of vinyl type paints shall be done only by the manufacturer. Unless otherwise specified, the color of undercoats shall match the color of the finish paint as nearly as practicable.

(3) The method of surface preparation and pretreatment shown in the schedule is for identification purposes only. Cleaning and pretreatment of surfaces prior to painting shall be accomplished in accordance with detailed requirements hereinbefore described.

(4) The designated titles of Federal and other standard specifications, which are identified by symbol or abbreviated name elsewhere in this specification, are as follows.

Federal Specifications:

TT-A-468.	Aluminum-Pigment; Powder and Paste for Paint.
TT-B-846.	Butyl Alcohol; Normal (for use in organic coatings).
TT-C-120.	Carbon-black; Dry (Paint-Pigment).
TT-E-489b.	Enamel; Gloss, Synthetic (for exterior and interior surfaces).
TT-E-506c.	Enamel, Tints and White, Gloss, Interior.
TT-E-508.	Enamel; Interior, Semi-gloss, Tints and White.

TT-E-543.	Enamel-undercoat, Interior, Tints and White.
TT-M-268.	Methyl Isobutyl Ketone (for use in organic coatings).
TT-P-29.	Paint, Latex Base, Interior, Flat, White and Tints.
TT-P-56b.	Primer Coating (Primer-Sealer), Pigmented Oil, Plaster and Wall-board.
TT-P-61b.	Paint; Ready-mixed, Black.
TT-P-81c.	Paint; Ready-mixed, Exterior Medium Shades on a Lead-Zinc Base.
TT-P-86a.	Paint; Red-lead base, Ready-mixed.
TT-P-102.	Paint (Titanium-lead-zinc, and oil, exterior, ready-mixed, white and light tints).
TT-P-375.	Pigment, Indian Red and Bright Red (iron oxide), Dry (for use in protective coatings).
TT-P-641b.	Primer, Paint; Zinc Dust-zinc Oxide (for galvanized surfaces).
TT-T-291a.	Thinner; Paint, Volatile Mineral Spirits (petroleum-spirits).
TT-T-306.	Thinner; Synthetic-enamel.
TT-T-425a.	Titanium-dioxide; Dry (Paint Pigment).
TT-T-548a.	Toluol (for use in organic coatings).
TT-T-656a.	Tricresyl Phosphate.
TT-V-119.	Varnish; Spar, Phenolic-resin.
Fed. Standard 141.	Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling and Testing.
595.	Colors.

Military Specifications:

MIL-M-10578B.	Metal Conditioner and Rust Remover (Phosphoric Acid Base).
MIL-P-15328B.	Primer, Pretreatment (Formula No. 117 for Metals).
MIL-C-16173A.	Corrosion Preventive, Solvent Cut-Back, Cold-Application.

(5) Special formulations indicated in the schedule which are not covered by Federal or other nationally recognized standard specifications are shown in paragraph 40-05.

b. Painting Schedule (Exterior and Interior Surfaces). -

(1) Exterior Ferrous Surfaces Subject to Atmospheric Exposure.

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied			
		1st Coat	2nd Coat	3rd Coat	4th Coat
Exterior ferrous surfaces subject only to normal atmospheric exposure, not otherwise specified.	Solvent cleaning and wire brush (or equivalent); no pretreatment.	Fed.Spec. TT-P-86a Type I.	P-9	P-9	None
Main entrance doors Water Supply Intake Tower and Flood Control Gate Shaft Structures.	Manufacturers Standard.	Mfrs.Std.	Fed.Spec. TT-E-489b (Class A)	Fed.Spec. TT-E-489b (Class A)	None

Directions and Remarks

In the above system, the first coat shall be brush applied in the shop at a maximum spreading rate of 600 square feet per gallon and touched up as required in the field. The second and third coats shall be applied in the field at a maximum spreading rate of 500 square feet per gallon. Exterior ferrous surfaces shall include all structural steel exposed to the atmosphere except that inclosed within weathertight structures.

(2) Ferrous Surfaces Subject to Immersion and Abrasion in Fresh Water. -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied				
		1st Double Spray Coat	2nd Double Spray Coat	3rd Double Spray Coat	4th Double Spray Coat	5th Double Spray Coat
Surfaces of ferrous components subject to immersion in waters including gates and gate guides, conduit levers, air vent transition and piping, float well intakes, and cast iron water supply pipe.	Blast clean only (no pretreatment).	Vinyl V-766 (gray)	Vinyl V-766 (white)	Vinyl V-766 (gray)	Vinyl V-766 (white)	Vinyl V-766 (gray)

Directions and Remarks

The above vinyl system(s) shall be spray applied to an average dry film thickness of at least 7.5 mils for the completed system and the minimum thickness at any point shall be not less than 6.0 mils. The number of coats indicated above is intended as a guide only and may not furnish the required film thickness under certain weather conditions or with operators unfamiliar with the vinyl paints. The specified total film thickness shall be attained in any event and any additional coats needed to do so shall be applied at no additional cost to the Government. Entire surfaces of the designated item shall be cleaned and painted as though subject to immersion even though part of the surface will be only in atmospheric exposure. Alternate shades of paint specified for the system shall be furnished by the manufacturer; tinting of vinyl paints in the field will not be permitted. See specific directions for applying vinyl type paints.

(3) Ferrous Surfaces Subject to High Temperatures. -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied			
		1st Coat	2nd Coat	3rd Coat	4th Coat
Exterior or interior metal surfaces subject to high temperatures as follows: Exhaust Piping from Generator Engine.	Solvent cleaning and wire brush (no pretreatment).	Two Coats Bitumastic Hi-Heat Gray Koppers Co., Inc., or approved equal.			

(4) Exterior and Interior Galvanized Metal Surfaces.

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied			
		1st Coat	2nd Coat	3rd Coat	4th Coat
Exterior and interior galvanized metal surfaces, as follows: (a) All interior galvanized surfaces, operating floor and basement, **Flood Control Gate Shaft**, and operating floor, **Water Supply Intake Tower**. **(b)** All exterior galvanized surfaces Gate Shafts, Operating House and Water Supply Intake Tower.	Wash with solvents and apply vinyl type wash coat MIL spec. MIL-P-15328B.	TT-P-641b (Type II)	TT-E-489b (Class A)	TT-E-489b (Class A)	

(5) Interior Ferrous Surfaces. -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied			
		1st Coat	2nd Coat	3rd Coat	4th Coat
Interior ferrous surfaces, not otherwise specified.	Solvent cleaning and wire brush. No pretreatment.	Fed.Spec. TT-P-86a (Type I).	Fed.Spec. TT-E-489b (Class A).	None	None
Entrance Doors-Structure.	-	As specified for exterior.			
Gasoline-Electric Generator set.	-	Manufacturer's Standard 1st and 2nd coats.		Fed.Spec. TT-E-489b (Class A).	None
Fuel Storage Tank within Buildings	-	TT-P-86a (Type I).	P-9	P-9	

Directions and Remarks

First coat shall be brush applied in the shop and its integrity maintained at all times by periodic touch-up painting in the field. Structural steel and miscellaneous ferrous surfaces in finished spaces shall, in lieu of the specified second coat, be finish-painted to match adjacent painted surfaces.

(6) Interior Radiators, Ducts, Pipes, etc., in Finished Spaces. -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Interior radiators, ducts, conduit, tubing, pipes, fabric-covered insulated pipes, and similar miscellaneous items in finished and painted spaces.	Remove foreign matter. Wire brush as required.	Prime as required for applicable surfaces.	Number of coats, type of finish paint and color to match adjacent surfaces.		

Directions and Remarks

Color to match adjacent wall or ceiling surfaces. Fabric cover on insulated pipe shall be thoroughly sized before painting as hereinbefore specified.

(7) Ferrous Pipe, Pipe Hangers, Conduit, Tubing, etc. (Nongalvanized) in Unfinished Spaces. -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Ferrous pipe, hangers, conduit, etc. (nongalvanized), in unfinished spaces of Flood Control Gate Shaft and Water Supply Intake Tower.	Remove foreign matter. Wire-brush as required.	TT-P-86a (Type II)	TT-E-489b (Class A)	TT-E-489b (Class A)	None

Directions and Remarks

Finish color to match adjacent painted machinery or as directed by the Contracting Officer.

(8) Interior Walls and Ceilings (Operator's Quarters and Utility Buildings).

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Interior gypsum wallboard walls and ceilings.		Fed.Spec. TT-P-29 (Type I)	Fed.Spec. TT-P-29 (Type I)	None	None
Interior plaster walls and ceilings.	As previously specified.	TT-P-56b.	TT-E-543.	TT-E-506.	

Directions and Remarks

Allow new plaster surfaces to dry and age at least 30 days before painting. Uncoated nails or other exposed ferrous metal on surfaces to be painted shall be spot-primed with an approved metal primer.

(9) Exterior Woodwork. -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Exterior woodwork on buildings not otherwise specified.	Solvent cleaning, scraping, sandpapering as required.	Fed.Spec. TT-P-25a.	Fed.Spec. TT-P-102.	Same as 2nd.	-
Shingles	Prestained with Fed.Spec.TT-S-706. (color as selected by Contracting Officer)	One thin field coat to match original stain.			
Vertical groove plywood siding.		Fed.Spec. TT-S-706.	Fed.Spec. TT-S-706.	None	

Directions and Remarks

All millwork required to be painted shall be primed on all sides prior to installation. At least 3 days but not more than 4 shall be allowed between coats, in good drying weather. Runs of window frames and all edges of sash and doors shall be given two thin coats of spar varnish, Fed. Spec. TT-V-121c after painting. All plywood edges shall be sealed with a heavy coat of TT-P-25a.

(10) Interior Wood Surfaces (Painted). -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied			
		1st Coat	2nd Coat	3rd Coat	4th Coat
Interior wood surfaces, except for floors and except as otherwise specified.*					
Cellar Stair, Operator's Quarters.		Two coats boiled linseed oil.			

*In Operator's Quarters basement, except for stairs and doors including frames and trim, no painting of wood surfaces is required.

Directions and Remarks

Finish color as directed. Undercoats shall approximate the color of the finish coat. The first coat of TT-E-543 shall be thinned with one pint of mineral spirits or turpentine per gallon of base paint.

(11) Interior Wood Floors (Natural). -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied			
		1st Coat	2nd Coat	3rd Coat	4th Coat
Interior Wood Floors Operator's Quarters (except when tile or linoleum is to be installed).	Clean, sandpaper and fill as required.	Fed.Spec. TT-S-176b.	Fed.Spec. TT-S-176b.	Fed.Spec. P-W-155.	-

Directions and Remarks

Floors shall be sanded. Oak and similar open grain woods shall be filled with Fed. Spec. TT-F-336b wood filler prior to application of sealer, and all excess filler removed. Sealer shall be class 1 or 2 as required by type of flooring. Each application of sealer shall be followed by wiping and buffing operations to give a high quality finish prior to waxing.

(12) Operator's Quarters - Interior Wood Surfaces (Natural).

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Kitchen cabinets, living room planter box wall	Clean and sandpaper as required, stain with TT-S-711a, fill and seal as necessary.	Fed.Spec. TT-V-121c.	Fed.Spec. TT-V-121c.	Fed.Spec. TT-V-121c.	-

Directions and Remarks

Each coat of varnish shall be allowed to dry overnight and lightly sanded and then wiped clean prior to application of next coat. Final coat to have satin finish.

(14) Machinery, Interior and Exterior, Atmospheric Exposure.

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Machinery in interior or exterior atmospheric exposure, not otherwise specified.	Solvent Cleaning and wire brush	Fed.Spec. TT-P-86a (Type II)	Fed.Spec. TT-E-489b (Class A)	Fed.Spec. TT-E-489b (Class A)	None

Directions and Remarks

In lieu of the specified system, machinery may be coated in accordance with the manufacturer's standard practice, when specifically approved by the Contracting Officer. In either event, finish coats shall be of color as selected by the Contracting Officer.

Machine-finished surfaces shall be protected during the construction period with rust preventive compound conforming to MIL Spec. MIL-C-16173A, Grade I, unless otherwise specifically indicated.

40-05. SPECIAL PAINT FORMULATIONS NOT COVERED BY STANDARD SPECIFICATIONS. - a. Exceptions. - The provisions and raw materials specified in this section are applicable only to the special paint formulations shown hereinafter in detail and not to those finished product coatings governed by Federal or other Standard Specifications.

b. General. - Paints shall have the composition as indicated in the formulas listed herein. Except where otherwise specified or authorized, all paint shall be made by grinding together dry pigments and a liquid vehicle to form a smooth paint that will flow freely and will not settle or react deleteriously in containers. Where so specified, special pigments shall be packaged in separate containers for mixing on the job. Unless otherwise specified, grinding shall produce a fineness such that coarse particles and skins will not exceed 1.5 percent (total residue left on No. 325 screen) based on pigment. All paints shall be so processed as to insure that within a period of one year from date of manufacture, they will not gel, liver or thicken deleteriously, or form gas in the closed container.

c. Inspection and Tests. - Inspection and tests, except as otherwise indicated, will be performed in accordance with the applicable provisions of the latest current revision of Federal Standard 141, entitled "Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling and Testing".

d. Packaging and Labeling. - Paints and vehicles shall be packaged in standard containers not larger than 5 gallons in size, with removable friction or lug-type covers. Containers for vinyl type paints shall be lined with a coating resistant to the solvents in the formulations and capable of effectively isolating the paint from contact with the metal in the container. Containers for phenolic aluminum paint shall be of the double-compartment type with the pigment compartment suspended inside the main container in such a manner that the pigment is isolated from contact with the vehicle. Each container shall be clearly and durably labeled to indicate the purchaser's order number, date of manufacture, manufacturer's batch number, quantity and full name and color of the material. Pigmented paints shall be packaged in containers not larger than 5 gallons.

e. Colors and Tints. - Colors where specified shall conform to the listed chip on latest revision of Fed. Standard 595 "Colors". If not specified, the color shall be that naturally obtained from the required pigmentation.

f. Paint Formulations. - (1) Formula P-9; Aluminum Paint, Linseed-Tung Oil, Phenolic Varnish.

Ingredients	Gallons	Pounds	% by Wt.
Finish aluminum paste	14.1	172.0	21.0
Varnish (Fed. Spec. TT-V-119)	85.9	649.5	79.0
	100.0	821.5	100.0

Aluminum pigment shall be packaged separately for Formula P-9 and mixed with vehicle immediately prior to use. Each vehicle container shall be labeled to the latter effect together with instructions showing correct proportions of vehicle and aluminum pigment. The mixed paint shall dry through, suitable for recoating, in 12 hours. Samples of Formula P-9 being submitted for approval shall include separate samples of aluminum pigment, varnish and the phenolic resin and oils used in the manufacture of the varnish.

(4) Formula V-766; Vinyl Type White (or Gray) Paint. -

Ingredient	Parts by Weight
Vinyl Resin Type 3	8.7
Vinyl Resin Type 4	8.7
Titanium Dioxide (Type III) and tinting pigments	13.3
Tricresyl Phosphate Plasticizer	3.3
Toluene	23.1
Methyl Isobutyl Ketone	42.85
Propylene Oxide	0.05
	100.00

The dispersion of pigment for Formula V-766 shall be accomplished by means of pebble mills or other approved methods. Grinding of this formulation in steel lined or steel ball mills will not be permitted. No grinding aids, antisettling agents or any other materials except those shown in the formula will be permitted. A 1.5 mil (dry) film of the paint, spray applied to a clean, cold-rolled steel panel and dried 48 hours, shall exhibit excellent adhesion. The fineness of grind (Fed. Standard 141, Method 4411) shall be not less than 7. Unless otherwise directed, half of the V-766 paint shall be furnished as white and the remaining half gray, the latter obtained by thoroughly dispersing carbon black into the formulation. The gray color shall approximate Color No. 26231 of Federal Standard 595. Samples of Formula V-766 submitted for approval shall include separate samples of all ingredient materials.

g. Ingredient Materials. - (1) Aluminum powder shall conform to Fed. Spec. TT-A-468, "Aluminum-Pigment; Powder and Paste, for Paint", Type I, Class B.

(2) Synthetic iron oxide (red) shall conform to Fed. Spec. TT-P-375 for "Pigment, Indian Red and Bright Red (Iron Oxide), Dry (for use in protective coatings)", Type I or II. Additionally, the pigment shall have a maximum oil absorption of 24, and a specific gravity of 4.90 to 5.20 in accordance with Fed. Standard 141, Methods 4191 and 4181. When the pigment is dispersed into the specified vinyl paint formulation, the paint shall show no evidence of incompatibility or reaction between pigment and resin after 6 months storage. Pigment shade shall be as required to produce the finished paint color.

(3) Titanium dioxide shall conform to Fed. Spec. TT-T-425a for "Titanium Dioxide; Dry (Paint-Pigment)", Type III, chalk-resisting, silicon-aluminum-zinc treated (rutile).

(4) Carbon black shall conform to Fed. Spec. TT-C-120 for "Carbon Black; Dry (Paint-Pigment)", Form I or II, Class B.

(5) Tricresyl phosphate plasticizer shall conform to Fed. Spec. TT-T-656a, entitled "Tricresyl Phosphate".

(6) Vinyl Resin, Type 3, shall be a vinyl chloride-acetate copolymer of medium average molecular weight and shall contain 85 to 88 percent vinyl chloride and 12 to 15 percent vinyl acetate by weight. The resin shall have film-forming properties and shall, in the specified formulations, produce results equal to "Vinylite" resin VYHH as manufactured by the Bakelite Company.

(7) Vinyl resin, type 4, shall be a copolymer of the vinyl chloride-acetate type, shall contain (by weight) 1 percent interpolymerized dibasic acid, 84 to 87 percent vinyl chloride and 12 to 15 percent vinyl acetate. The resin shall have film-forming properties and shall, in the specified formulations, produce results equal to "Vinylite" resin, VMCH, as manufactured by the Bakelite Company.

(8) Mineral spirits shall conform to Fed. Spec. TT-T-291, "Thinner; Paint Volatile Mineral Spirits (Petroleum Spirits", Grade I.)

(9) Toluene shall conform to Fed. Spec. TT-T-548a, "Toluol (for Use in Organic Coatings)".

(10) Butanol shall conform to Fed. Spec. TT-B-846, "Butyl Alcohol; Normal (for Use in Organic Coatings)".

(11) Methyl isobutyl ketone (MIBK) shall conform to Fed. Spec. TT-M-268, "Methyl Isobutyl Ketone (for Use in Organic Coatings)".

(12) Thinner T-10 for Vinyl Coatings shall consist of 10 percent methyl isobutyl ketone (by weight) and 90 percent toluene.

(13) Propylene oxide shall be a commercially pure product suitable for the intended use.

SECTION 41

BITUMINOUS CONCRETE PAVEMENT
(Item 94)

(Index)

Paragraph No.	Paragraph Title	Page No.
41-01	Scope	41-1
41-02	Description	41-1
	a. Asphalt	41-1
	b. Rate of Application	41-1
	c. Certified Analysis	41-1
	d. Weather Limitations	41-1
	e. Curing	41-1
41-04	Bituminous Concrete Pavement	41-1
	a. Testing and Approval	41-1
	b. Compaction of Mixture	41-2
41-05	Measurement and Payment	41-2

SECTION 41

BITUMINOUS CONCRETE PAVEMENT
(Item 94)

41-01. SCOPE. - This section covers bituminous concrete pavement treatment, including prime coat, complete.

41-02. DESCRIPTION. - The bituminous concrete pavements shall be constructed on a primed road gravel base. The 2 1/2-inch pavement shall be constructed in 2 courses consisting of a 1 1/2-inch bottom course and a 1-inch top course.

41-03. PRIME COAT. - a. Asphalt. - Bituminous material for the prime coat shall conform to Federal Specification SS-A-671a(1), designation MC-0 or MC-1.

b. Rate of Application. - Prime coat shall be applied at the rate of approximately 0.40 gallons per square yard of base course. The exact quantity, which may be varied to suit field conditions will be determined by the Contracting Officer. The bituminous material shall be applied at a temperature within the range of 70 - 140 F. for MC-0 and 110 - 185 F. for MC-1.

c. Certified Analysis. - The source from which the bituminous material is to be obtained shall be selected before the material is required for use in the work and a copy of the certified analysis representative of the material to be employed in the work, shall be submitted for approval not less than 15 working days before commencing work.

d. Weather Limitations. - Prime coat shall be applied only when the atmospheric temperature has not been below 35 degrees for 12 hours, immediately prior to application.

e. Curing. - Following the application of prime material, the surface shall be allowed to dry without being disturbed for a period of not less than 48 hours, or longer as may be necessary to attain penetration into the base and evaporation of the volatiles from prime material.

41-04. BITUMINOUS CONCRETE PAVEMENT. - Bituminous binder and surface courses shall conform to Standard Top and Bottom Courses in Section B-18, Class I, Bituminous Concrete Pavement, Type I - 1 of the Standard Specifications for Highways and Bridges, Commonwealth of Massachusetts, Department of Public Works, revised April 1961, with the following modifications:

a. Testing and Approval. - Suitably sized samples of the bituminous binder and surface course mixes proposed for use in the work, together with the proposed job-mix formula conforming to the requirements of the Commonwealth of Massachusetts standard specifications, shall be submitted for testing and approval to the Contracting Officer by the contractor not less than 15 days prior to the time of contemplated use in the work. The approximate quantities of materials to be submitted are as follows:

Binder course mix	25 pounds
Surface course mix	25 pounds

The contractor will be notified, in writing, within 15 days after receipt of satisfactory mixes relative to the approval of the proposed job mix formulas.

b. Compaction of Mixture. - Rolling of both the surface course and binder course shall be continued until all roller marks are eliminated and a density of at least 95 percent of the calculated density of a voidless mixture composed of the same materials in like proportion.

41-05. MEASUREMENT AND PAYMENT. - Bituminous concrete road surfacing will be measured by the square yard of actual area installed. Bituminous concrete road surfacing will be paid for at the contract unit price per square yard for Item No. 94, "Bituminous Concrete Surfacing", which price shall constitute full compensation for all costs in connection with the furnishing of all equipment, supplies, and materials and in performing the the work specified in this section, including prime coat.

SECTION 42

BITUMINOUS SURFACE TREATMENT
(ITEM 95)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
42-01	Scope	42-1
42-02	Applicable Publications	42-1
	a. Federal Specification	42-1
	b. American Society for Testing Materials Serial Designation	42-1
	c. American Association of State Highway Officials Standard Method	42-1
42-03	Description	42-1
42-04	Materials	42-2
42-05	Sampling and Testing	42-3
42-06	Quantities of Materials Per Square Yard	42-3
42-07	Equipment	42-4
	a. Bituminous Distributor	42-4
	b. Heating Equipment	42-5
	c. Power Rollers	42-5
	d. Mechanical Spreaders	42-5
	e. Broom Drags	42-5
	f. Power Brooms and Power Blowers	42-5
	g. Rubber-Tired Rollers	42-5
	h. Scales	42-6
42-08	Weather Limitations	42-6
42-09	Conditioning of Base Course	42-6
42-10	Preparation of Surface	42-6
42-11	Application of Bituminous Prime Coat Materials	42-6

Paragraph No.	Paragraph Title	Page No.
42-12	First Application of Bituminous Material for Double Surface Treatment	42-7
42-13	First Spreading of Aggregate	42-7
42-14	Brooming and Rolling First Course	42-7
42-15	Second Application of Bituminous Material	42-8
42-16	Second Spreading of Aggregate	42-8
42-17	Brooming and Rolling Second Course	42-8
42-18	Payment	42-8

SECTION 42

BITUMINOUS SURFACE TREATMENT

(ITEM 95)

42-01. SCOPE. - This section covers all operations in connection with the construction of bituminous surface treatment consisting of a prime coat and a double bituminous surface treatment on road gravel base, complete.

42-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification.

a. Federal Specification. -

SS-A-671a.	Asphalt; Cut-Back (for) Road-Work.

b. American Society for Testing Materials Serial Designations. -

C 29-60.	Standard Method of Test for Unit Weight of Aggregate.
C 131-55.	Standard Method of Test for Abrasion of Coarse Aggregate by Use of the Los Angeles Machine.
C 136-39.	Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates.
D 75-59.	Methods of Sampling Stone, Slag, Gravel, Sand and Stone Block for Use as Highway Materials
D 140-55.	Standard Methods of Sampling Bituminous Material.

c. American Association of State Highway Officials Standard Method. -

T 102-42.	Standard Method of Spot Test of Asphaltic Materials.

42-03. DESCRIPTION. - The bituminous prime coat covered herein shall consist of an application of hot bituminous material on a previously prepared road gravel base. The double bituminous surface treatment for primed base courses shall consist of a first application of bitumen covered with mineral aggregate properly compacted, followed by a second application of bitumen covered with mineral aggregate and rolled to a smooth surface presenting an even texture.

42-04. MATERIALS. - a. The bituminous material used for the prime coat shall be cutback asphalt and shall conform to the requirements of Federal Specification SS-A-671, designation MC-0 or MC-1, with the additional requirements that the residue from distillation to 680 degrees F. shall show a negative spot when submitted to AASHO Standard Method T 102, using standard naphtha specified in Paragraph 3 thereof. Application temperatures shall be as follows:

MC-0.	50-120 degrees F.
MC-1	80-125 degrees F.

b. The materials used in the application of the double bituminous surface treatment shall be mineral aggregate and bituminous material, of the following types, gradations, grades, and consistencies:

(1) Mineral Aggregate. - Mineral aggregate shall consist of crushed stone or crushed gravel, free from adherent films of clay, and shall be of such nature that a thorough coating of the bituminous material used in the work will not strip off upon contact with water. The moisture content of the aggregate shall not be sufficient to prevent it from being readily coated with the bituminous material. Drying may be required as directed by the Contracting Officer. Aggregates shall have a percentage of wear not exceeding 40 after 500 revolutions, as determined by ASTM Serial Designation C 131.

(a) Crushed Stone. - Crushed stone shall consist of clean, sound, durable fragments of stone, free from an excess of flat, elongated, soft, or disintegrated pieces, dust, dirt, or other objectionable matter.

(b) Crushed Gravel. - Crushed gravel shall consist of clean, sound, durable pieces, free from an excess of soft, or disintegrated particles, dust, dirt, or other objectionable matter. At least 70 percent of the crushed gravel retained on the No. 4 sieve shall consist of fractured angular pieces.

(2) Gradation of Aggregates. - The crushed stone or crushed gravel shall conform to the grading shown below. The gradation of the aggregates shall be determined by ASTM Serial Designation C 136.

SECTION 42

BITUMINOUS SURFACE TREATMENT
(ITEM 95)

42-01. SCOPE. - This section covers all operations in connection with the construction of bituminous surface treatment consisting of a prime coat and a double bituminous surface treatment on road gravel base, complete.

42-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification.

a. Federal Specification. -

SS-A-671a.	Asphalt; Cut-Back (for) Road-Work.

b. American Society for Testing Materials Serial Designations. -

C 29-60.	Standard Method of Test for Unit Weight of Aggregate.
C 131-55.	Standard Method of Test for Abrasion of Coarse Aggregate by Use of the Los Angeles Machine.
C 136-39.	Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates.
D 75-59.	Methods of Sampling Stone, Slag, Gravel, Sand and Stone Block for Use as Highway Materials
D 140-55.	Standard Methods of Sampling Bituminous Material.

c. American Association of State Highway Officials Standard Method. -

T 102-42.	Standard Method of Spot Test of Asphaltic Materials.

42-03. DESCRIPTION. - The bituminous prime coat covered herein shall consist of an application of hot bituminous material on a previously prepared road gravel base. The double bituminous surface treatment for primed base courses shall consist of a first application of bitumen covered with mineral aggregate properly compacted, followed by a second application of bitumen covered with mineral aggregate and rolled to a smooth surface presenting an even texture.

42-04. MATERIALS. - a. The bituminous material used for the prime coat shall be cutback asphalt and shall conform to the requirements of Federal Specification SS-A-671, designation MC-0 or MC-1, with the additional requirements that the residue from distillation to 680 degrees F. shall show a negative spot when submitted to AASHO Standard Method T 102, using standard naphtha specified in Paragraph 3 thereof. Application temperatures shall be as follows:

MC-0.	50-120 degrees F.
MC-1	80-125 degrees F.

b. The materials used in the application of the double bituminous surface treatment shall be mineral aggregate and bituminous material, of the following types, gradations, grades, and consistencies:

(1) Mineral Aggregate. - Mineral aggregate shall consist of crushed stone or crushed gravel, free from adherent films of clay, and shall be of such nature that a thorough coating of the bituminous material used in the work will not strip off upon contact with water. The moisture content of the aggregate shall not be sufficient to prevent it from being readily coated with the bituminous material. Drying may be required as directed by the Contracting Officer. Aggregates shall have a percentage of wear not exceeding 40 after 500 revolutions, as determined by ASTM Serial Designation C 131.

(a) Crushed Stone. - Crushed stone shall consist of clean, sound, durable fragments of stone, free from an excess of flat, elongated, soft, or disintegrated pieces, dust, dirt, or other objectionable matter.

(b) Crushed Gravel. - Crushed gravel shall consist of clean, sound, durable pieces, free from an excess of soft, or disintegrated particles, dust, dirt, or other objectionable matter. At least 70 percent of the crushed gravel retained on the No. 4 sieve shall consist of fractured angular pieces.

(2) Gradation of Aggregates. - The crushed stone or crushed gravel shall conform to the grading shown below. The gradation of the aggregates shall be determined by ASTM Serial Designation C 136.

Percentage by weight passing square mesh sieves

Sieve Designation	Coarse Aggregate	Key Aggregate
3/4"	100	--
1/2"	90-100	--
3/8"	40-70	100
No. 4	0-15	85-100
No. 8	0-5	10-40
No. 16	---	0-10

(3) Bituminous Materials. - The bituminous materials used for the double bituminous surface treatment shall conform to the following:

(a) Rapid Curing Cut-Back Asphalt. - The rapid curing cut-back asphalt shall conform to the requirements of Federal Specification SS-A-671, Grade RC-4, or RC-5. In addition to the requirements of the Federal Specification, the residue from distillation to 680 degrees F. shall show a negative spot when submitted to AASHO Standard Method T 102, using the standard naphtha specified in Paragraph 3 thereof. Application temperatures shall be within the following ranges:

RC-4. . . . . 175-250 degrees F.
RC-5. . . . . 200-275 degrees F.

42-05. SAMPLING AND TESTING. - The source(s) from which the aggregates are to be obtained shall be selected in advance of the time when the materials are required for use in the work. Suitably sized samples of bituminous material together with a copy of their certified refinery analyses and samples of aggregates shall be submitted to the Contracting Officer for approval not less than 21 days before commencing the work. All sampling of materials, unless otherwise directed, shall be in accordance with ASTM Serial Designation D 75 for aggregates and ASTM Serial Designation D 140 for bituminous material. Only those materials that have demonstrated by service tests to be satisfactory for the work shall be used as approved by the Contracting Officer. All test samples shall be supplied by the contractor at his expense, and all tests will be made by the Contracting Officer, without cost to the contractor. Additional samples of materials shall be furnished by the contractor during construction, as required by the Contracting Officer. Sampling of materials will be observed and supervised by the Contracting Officer when deemed necessary.

42-06. QUANTITIES OF MATERIALS PER SQUARE YARD. - a. Bituminous material for the prime coat shall be applied at the approximate rate of 0.40 gallon per square yard of base course. The exact quantity may be varied to suit field conditions.

b. The bitumen and aggregate for the double bituminous surface treatment shall be spread in the quantities shown below. Upon commencement of the work, and during its progress, the individual quantities of bitumen and aggregate may be varied to meet specific field conditions, as directed by the Contracting Officer, without adjustments to contract unit prices, but the amount in all cases shall be within the limits specified. The weights shown in this table are those of aggregates having a specific gravity of 2.65. If the specific gravity of the aggregate to be used is other than 2.65, appropriate adjustments shall be made in the number of pounds of aggregate required per square yard to insure a constant volume of aggregate per square yard of treatment.

Grading	Bitumen gallons per square yard First Application	Aggregate pounds per square yard First Spreading	Bitumen gallons per square yard Second Application	Aggregate pounds per square yard Second Spreading
Coarse Aggregate	0.25-0.35	35-45	---	---
Key Aggregate	---	---	0.20-0.30	15-25

42-07. EQUIPMENT. - All equipment, tools, and machines used in the performance of the work covered by this section of the specifications shall be subject to the approval of the Contracting Officer, and shall be maintained in satisfactory working condition at all times.

a. Bituminous Distributor. - Bituminous distributor shall have pneumatic tires of such width and number that the load produced on the base surface shall not exceed 650 pounds per inch of tire width. It shall be so designed and equipped as to distribute the bituminous material uniformly at even heat on variable widths of surface at readily determined and controlled rates ranging from 0.05 to 2.0 gallons per square yard, with a pressure range of from 25 to 75 pounds per square inch, with an allowable variation from any specified rate not exceeding 5 percent. The distributor equipment shall include an independently operated bitumen pump, tachometer, pressure gages, volume measuring devices, a thermometer for reading the temperature of tank contents, and a hose attachment suitable for applying bituminous material to spots missed by the distributor. The distributor shall be equipped for circulation and agitation of the bituminous material during the heating process.

b. Heating Equipment. - Heating equipment for heating bituminous materials shall consist of steam coils and equipment for producing steam, so designed that steam will not be introduced into the material. In the event storage tanks are used, an armored thermometer with a range from 50° F. to 400° F. shall be fixed to the tank so that the temperature of the bituminous material may be determined at all times.

c. Power Rollers. - Power rollers shall be steel-wheel or rubber-tired type conforming to the following requirements:

(1) Steel-wheel rollers shall be of either tandem or 3-wheel construction weighing not less than 5 tons, and shall be suitable for rolling bituminous pavements. The wheels of the rollers shall be equipped with adjustable scrapers. The rollers shall be equipped with water tanks and sprinkling apparatus that shall be used when necessary to keep the wheels wet, thus preventing adherence of bituminous material to the wheels.

(2) The rubber-tired roller shall be self-propelled and equipped with not less than 9 wheels mounted on 2 axles in such manner that the rear tires will not follow in the tracks of the forward group. The pneumatic roller shall also be equipped with suitable boxes or platforms for ballast loading and when loaded with ballast shall weigh not less than 10 tons. The tires shall be uniformly inflated to not less than 45 pounds per square inch pressure.

d. Mechanical Spreaders. - Mechanical spreaders shall be adjustable, and capable of spreading aggregate at controlled amounts per square yard.

e. Broom Drags. - Broom drags shall consist of brooms of the street type, mounted in a frame in such a manner as to spread the aggregate uniformly over the surface of the area to be treated. The drags shall be equipped with tow plates for towing. Towing equipment shall also be pneumatic-tired.

f. Power Brooms and Power Blowers. - Power brooms and power blowers shall be suitable for effectively cleaning the surfaces to be treated.

g. Rubber-Tired Rollers. - Rubber-tired rollers shall consist of 2 axles on which are mounted not less than 9 pneumatic-tired wheels in such manner that the rear group of tires will not follow in the tracks of the forward group. The axles shall be suitable for ballast loading. The tires shall be uniformly inflated. The rollers shall be weighted as directed by the Contracting Officer. The tractor or other towing equipment shall aslo be penumatic-tired.

49

h. Scales. - Scales shall be standard truck scales of the beam type. The scales shall be of sufficient size and capacity to accommodate all trucks used in hauling aggregates. All scales shall be tested and approved by an inspector of the state inspection bureau charged with scales inspection within the state in which the project is located.

42-08. WEATHER LIMITATIONS - The prime coat and double bituminous surface treatment shall be applied only when the base course is dry and when the temperature has not been below 35° F. for at least 12 hours immediately prior to application. The prime coat and double bituminous surface treatment shall not be applied when the atmospheric temperature is below 50° F.

42-09. CONDITIONING OF BASE COURSE. - The surfaces of the primed road gravel base course will be inspected and tested for tolerances by the Contracting Officer. Any deviations in excess of the specified requirements shall be corrected as directed by the Contracting Officer. Any ruts or soft-yielding spots that may appear in the base course shall be corrected by loosening, removing, or adding material, reshaping, and recompacting to line and grade, as directed by the Contracting Officer.

42-10. PREPARATION OF SURFACE. - Immediately before applying the prime coat, all loose material, dirt, clay, or other objectionable material, shall be removed from the surface to be primed with a power boom or blower supplemented with hand brooms, as directed by the Contracting Officer. After the cleaning operation, and prior to the application of the prime coat, an inspection of the area to be coated will be made by the Contracting Officer to determine its fitness to receive the bituminous priming material. That portion of the base course prepared for immediate treatment, if considered excessively dry, shall be lightly sprinkled with water immediately in advance of the application, as directed by the Contracting Officer, to assure a uniform spread of the bituminous material.

42-11. APPLICATION OF BITUMINOUS PRIME COAT MATERIAL. - Immediately following the preparation of the base course, the bituminous prime coat material shall be applied by means of a bituminous distributor at the applicable temperature specified above. The bituminous material shall be applied at the pressure and in the amounts as directed by the Contracting Officer. The priming material shall be so applied that uniform distribution is obtained at all points of the surface to be primed or treated. Unless the distributor is equipped so as to obtain satisfactory results at the junction of previous and subsequent applications, building paper shall be spread on the surface for a sufficient distance back from the ends of each application so that flow through the sprays may be started and stopped on the paper, and that all sprays will be operating at full force on the surface to be treated. Immediately after the application, the building paper shall be removed and destroyed. All spots unavoidably missed by the distributor shall be properly treated with bituminous material. Following the application of prime material, the surface shall be allowed to dry for a period of not less than 48 hours without being disturbed, or for such additional period of time as may be necessary to attain penetration into the foundation course and drying out or evaporation of the volatiles from prime material, which period shall be determined by the Contracting Officer. The contractor shall furnish and spread sufficient approved sand on all areas which show an excess of bituminous material to effectively blot up and cure the excess, as directed. The primed surface shall be maintained by the contractor until the succeeding layer of pavement has been placed. During the interval, the contractor shall protect the primed surface against damage and shall repair all broken spots.

42-12. FIRST APPLICATION OF BITUMINOUS MATERIAL FOR DOUBLE SURFACE TREATMENT. - The first application of bituminous material for the surface treatment shall be applied by means of a bituminous distributor at the temperature determined by the Contracting Officer, within the ranges specified in Paragraph 42-04b(3). The bituminous material shall be applied at the pressure and in the amounts, within the limits specified in Paragraph 42-06, as determined by the Contracting Officer. The bituminous material shall be so applied that uniform distribution is obtained over all points of the surface to be treated. Unless the distributor is equipped so as to obtain satisfactory results at the junction of previous and subsequent applications, building paper shall be employed as specified above. All lightly coated areas and spots missed by the distributor shall be properly treated with bituminous material applied by hand.

42-13. FIRST SPREADING OF AGGREGATE. - Immediately following the first application of bituminous material for the double surface treatment, the coarser aggregate shall be spread uniformly over the surface, in amounts, within the limits specified above, as directed by the Contracting Officer. Spreading shall be done with aggregate spreading equipment of the type specified. The aggregate shall be spread evenly by hand on all areas missed by the aggregate spreader. Trucks spreading aggregate shall be operated backwards, so that the bituminous material will be covered ahead of the truck wheels. When hand spreading is employed, aggregate shall be dumped in piles adjacent to the area to be treated and spread by means of shovels. The aggregate shall be placed in sufficient quantities, within the limitations specified, to provide a small roll of surplus material ahead of the broom drag, thus preventing the broom drag from turning over the coated aggregate. Back-spotting or sprinkling of additional aggregate over areas having insufficient cover shall be done by hand and shall be continued during the operations whenever necessary.

42-14. BROOMING AND ROLLING FIRST COURSE. - The surface shall be rolled after sufficient aggregate is spread to prevent pick-up of the bituminous material, and rolling shall continue until no more aggregate can be worked into the surface. The surface shall be broom dragged as soon as possible after rolling, but not until the surface has set sufficiently to prevent excessive marking. Broom dragging shall continue until the aggregate is uniformly distributed over the surface. Broom dragging, rolling, and back-spotting shall continue until the surface is cured and rolled sufficiently to key and set the aggregate, as approved by the Contracting Officer. In all places not accessible to the rollers, the aggregate shall be adequately compacted with hand tampers. Hand tampers shall weigh not less than 25 pounds and shall have a tamping face area of not more than 50 square inches. Any aggregate that becomes coated or mixed with dirt or any other foreign matter shall be removed, replaced with clean aggregate, and rerolled, as directed by the Contracting Officer. All surplus aggregate shall be swept off the surface and removed prior to the second application of bituminous material. The contractor shall maintain and protect the treated areas by barricades, if necessary, until the second application of bituminous material is applied.

42-15. SECOND APPLICATION OF BITUMINOUS MATERIAL. - The second application of bituminous material shall follow within 24 hours after the construction of the first course, weather permitting, unless the treated surface is excessively moistened by rain, when it shall be allowed to dry for such time as is deemed necessary by the Contracting Officer. The second application of bituminous material shall be applied in the manner specified for the first application, at the temperature as determined by the Contracting Officer, within the ranges specified. The bituminous material shall be also applied at the pressure and in the amounts, within the limits specified, as directed by the Contracting Officer.

42-16. SECOND SPREADING OF AGGREGATE. - Immediately following the second application of bitumen, the finer (key) mineral aggregate conforming to the grading specified shall be spread uniformly over the bituminous material in amounts, within the limits specified, as directed by the Contracting Officer. The aggregate shall be spread and processed in the manner specified above.

42-17. BROOMING AND ROLLING SECOND COURSE. - The surfaces shall be rolled and broom-dragged in the manner specified in paragraph 42-14 above, until a smooth, even textured surface is produced. All surplus aggregate shall be swept off the surface and removed prior to final acceptance.

42-18. PAYMENT. - Measurement will be by the square yard of surface actually receiving the bituminous treatment. Payment will be made at the contract unit price per square yard for Item 95, "Bituminous Surface Treatment", which price shall constitute full compensation for all work specified in this section, including prime coat and sand cover.

SECTION 43

TOPSOILING, SEEDING AND MULCHING
(Items 105, 106, and 107)

INDEX

Paragraph No.	Paragraph Title	Page No.
43-01	Scope	43-1
43-02	Definitions	43-1
	a. Earth Material	43-1
	b. Class A Seedbed	43-1
	c. Class B Seedbed	43-1
	d. Class D Seedbed	43-2
	e. Class D Seedbed	43-2
	f. Class A Seed d	43-2
	g. Class B Seed	43-2
43-03	Procurement of Topsoil	43-2
43-04	Materials	43-2
	a. Fertilizer	43-2
	b. Lime	43-2
	c. Seed	43-2
	d. Mulch	43-3
43-05	Inspection and Tests	43-4
	a. Topsoil	43-4
	b Fertilizer and Lime	43-4
	c. Seed	43-4
	d. Mulch	43-4
	e. Nomenclature	43-5
43-06	Treatment of Areas to be Topsoiled and/or Seeded	43-5
43-07	Preparation of Subgrade	43-6
	a. General	43-6
	b. Grading	43-6
	c. Tilliage	43-6
	d. Approval	43-6
43-08	Placing Topsoil	43-6
43-08	Preparation of Seedbed	43-7
	a. General	43-7
	b. Fine Grading	43-7
	c. Application of Fertilizer and Lime	43-7
	d. Leveling	43-8

Paragraph No.	Paragraph Title	Page No.
43-10	Planting Seed	43-8
	a. General	43-8
	b. Treatment of Borrow Area B	43-8
	c. Rates	43-9
	d. Broadcast Seeding	43-9
	e. Drill Seeding	43-9
	f. Floss Spraying	43-9
43-11	Compacting	43-9
43-12	Applying Mulch	43-10
43-13	Securing Mulch	43-10
43-14	Protection	43-10
43-15	Clean-Up	43-10
43-16	Establishment	43-10
	a. General	43-10
	b. Watering	43-10
	c. Mowing	43-11
	d. Refertilizing and Reseeding	43-11
	e. Mulch	43-11
43-18	Cover Seeding	43-11
43-19	Additional Mulching	43-11
43-20	Measurement and Payment	43-12
	a. Topsoil	43-12
	b. Seeding	43-12
	c. Measurement	43-12
	d. Payment for Topsoiling or seeding	43-12
	e. Separate Payment	43-12

SECTION 43

TOPSOILING, SEEDING AND MULCHING
(Items 105, 106, and 107)

43-01. SCOPE. This section covers topsoiling and seeding, complete.

43-02. DEFINITIONS. - a. Earth Material. - The earth material consisting of the humus and the upper layer or layers of soil to a depth determined by the Contracting Officer, when used to construct a seedbed for the production of turf is defined as topsoil. Topsoil is classed as follows:

(1) Class A topsoil shall be salvaged from open fields and shall be natural, fertile, friable surface soil, without toxic substances injurious to vegetative growth, and clean and free from clay lumps, stones, clods, stumps, weed clumps, sticks, debris, and other objectionable matter two inches or more in any dimension. It shall be salvaged from the top 8 inches of stripped material.

(2) Class B topsoil shall be stripping material salvaged from construction and borrow areas. Stripping material which is to be used as Class B topsoil shall be cleaned by means of a bulldozer equipped with a root-raking blade or similar equipment so that it is reasonably free from stumps, logs, stones, roots and similar material having a maximum dimension of 8 inches or over.

(3) Class C topsoil shall be stripping material salvaged from construction and borrow areas. Material which will interfere with' placement, grading and seeding operations shall be removed.

(4) All material such as stones, roots, stumps, and other debris removed from topsoil in the process of cleaning it shall be transported and deposited in a designated spoil area.

b. Class A Seedbed. - A class A seedbed is a seedbed constructed by preparing the subgrade as required by Paragraph 43-07 of this section of the specifications, applying eight inches of class A topsoil, and grading to the required limits.

c. Class B Seedbed. - A class B seedbed is a seedbed constructed by preparing the subgrade as required by Paragraph 43-07 of this section of the specifications, applying a minimum of 8 inches of class B topsoil as required, and grading to the required limits; except that where directed, the thickness shall be 24 inches over exposed rock surfaces. Class A topsoil may be substituted for class B topsoil.

d. Class C Seedbed. - Class C seedbed is a seedbed constructed by preparing the subgrade as required by Paragraph 43-07 of this section of the specifications, applying a minimum of 8 inches of class C topsoil as required, and grading to required limits.

e. Class D Seedbed. - Class D seedbed is a seedbed constructed by properly preparing the soil surface in place after other operations have been completed. No topsoiling is required unless topsoiling is a part of another operation.

f. Class A Seed. - Class A seed is a seed mixture designed to produce a high quality lawn, and shall have a content as stated in Paragraph 43-04c of this section of the specifications.

g. Class B Seed. - Class B seed is a seed mixture designed to produce heavy turf to prevent surface erosion, and shall have a content as stated in Paragraph 43-04c of this section of the specifications.

43-03. PROCUREMENT OF TOPSOIL. - It shall be the responsibility of the contractor to salvage from construction and graded areas sufficient topsoil of the required classes to complete topsoiling as specified. Topsoil shall not be hauled, applied, or worked while in a frozen or muddy condition.

43-04. MATERIALS. - a. Fertilizer. - Fertilizer shall be 10-6-4 grade, uniform in composition, granular free-flowing and suitable for application with approved equipment, delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable State fertilizer laws, and bearing the name, trade name or trade-mark, and warranty of the producer.

b. Lime. - Lime shall be ground limestone containing not less than 85 percent of total carbonates and shall be ground to such fineness that at least 50 percent will pass through a 100-mesh sieve and at least 90 percent will pass through a 20-mesh sieve. Coarser materials will be acceptable provided the specified rates of application are increased proportionately, on the basis of quantities passing the 100-mesh sieve, but no additional payment will be made for the increased quantity.

c. Seed. - All seed used shall be labeled in accordance with U. S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of Invitation for Bids. All seed shall be furnished in sealed standard containers, unless exception is granted in writing by the Contracting Officer. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. The analysis of seed in each lot of mixture shall be as follows:

Kind of Seed	% by Wt. In Mixture	Min. % Purity	Min. % Germ.
CLASS A SEED			
Agrostis Tenuis hv. Highland Bentgrass	10	98	85
Festuca rubra Red Fescue (Columbia Cy. Strain)	35	98	85
Festuca rubra commutata Chewings Fescue	35	98	85
Poa pratensis Kentucky Bluegrass	15	85	75
Trifolium repens White Clover	5	98	85
CLASS B SEED			
Agrostis tenuis hv. Highland Bentgrass	5	98	85
Bromus inermis Smooth Brome	10	85	90
Festuca elatior arundinaceae hv Alta Fescue	30	98	85
Festuca rubra Red Fescue (Columbia Cy. strain)	35	98	85
Poa compressa Canada Bluegrass	15	80	75
Trifolium repens White Clover (New York Wild Strain)	5	98	85

1. For grass seed Classes A & B, weed seed not to exceed 1.0% of total mixture.

d. Mulch. - (To be used only on slopes of 1 on 5 or steeper. No mulching in Borrow Area B.)

(1) General. - Acceptable mulch shall be any of the following materials, or any approved locally available material other than these specified. Mulch material which contains an excessive quantity of matured seed of noxious weeds or other species which would grow and be detrimental to the desired turf, or provide a menace to surrounding farm land will not be acceptable. Material that is easily shifted by moderate wind action, or material that is caked or tightly matted, and will smother or excessively retard the growth of grass, will not be acceptable.

(a) Straw. - Straw shall consist of the threshed stalks of oats, wheat, barley, rye, flax, beans or peas.

(b) Hay. - Hay shall be cured, dried and shall be made up of native grasses, marsh or beach grasses.

43-05. INSPECTION AND TESTS. - a. Topsoil. - The topsoil proposed for use will be inspected by the Contracting Officer. At the time of inspection, the Contracting Officer will require representative soil samples to be taken, to be tested for physical properties and pH (or lime requirement), for organic matter, and for available phosphoric acid and potash. Samples shall be supplied by the contractor at the contractor's expense, and tests will be made under the supervision of the Contracting Officer without cost to the contractor. Sampling and testing will be in accordance with standard practices of soil testing.

b. Fertilizer and Lime. - Fertilizer and lime shall be of the required grades, uniform in composition, free-flowing and suitable for application with approved equipment, delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable State fertilizer laws, and bearing the name, trade name or trade-mark, and warranty of the producer. The Contracting Officer shall be furnished with duplicate copies of invoices for all fertilizer and lime used on the project. Invoices for fertilizer shall show the grade furnished. Invoices for lime shall show total minimum carbonates and minimum percentages of the material furnished that pass the 100- and the 20-mesh sieves. Each lot of fertilizer and lime shall be subject to sampling and testing at the discretion of the Contracting Officer. Sampling and testing will be in accordance with the official methods of the Association of Official Agricultural Chemists. Upon completion of the project, a final check of the total quantities of fertilizer and lime used will be made against the total area seeded, and, if the minimum rates of application have not been met, the Contracting Officer may require the distribution of additional quantities of these materials to make up the minimum application specified.

c. Seed. - The Contracting Officer shall be furnished with duplicate signed copies of a statement from the seed vendor, certifying that each container of seed delivered is fully labeled in accordance with the Federal Seed Act and is at least equal to the specification requirements specified hereinbefore, as furnished with the purchase order. This certification shall appear on, or with, all copies of invoices for the seed. Each lot of seed shall be subject to sampling and testing at the discretion of the Contracting Officer. Sampling and testing will be in accordance with the latest Rules and Regulations under the Federal Seed Act.

d. Mulch. - Not less than 30 days prior to date of intended use, the contractor shall notify the Contracting Officer of the sources from which the mulch materials are to be secured and the quantities thereof, and representative samples of the materials proposed to be used shall be furnished for approval.

e. Nomenclature. - The scientific and common names of seed materials specified herein conform with the latest approved names listed in "Standardized Plant Names: (1942 Edition) prepared by the American Joint Committee on Horticultural Nomenclature. Variety names not included therein are in conformance with names adopted by the U. S. Department of Agriculture and generally accepted in the seed trade.

43-06. TREATMENT OF AREAS TO BE TOPSOILED AND/OR SEEDED. - The following areas shall be topsoiled, seeded, mulched, and otherwise treated as required by this section of the specifications.

a. Areas as indicated on the drawings.

b. Areas not indicated on the drawings but which fall within the meaning of GC-9. These areas shall be treated at no additional cost to the Government.

c. Areas falling outside the limit of work line, areas within the limit of work line where no work is indicated on the drawings, and areas used for the convenience of the contractor including haul roads, storage areas, access roads, field office sites, parking areas, stockpile areas and areas of similar use, unless specifically exempted in writing by the Contracting Officer. These areas shall be treated at no additional cost to Government.

d. Areas as required by other sections of these specifications. The provisions of this paragraph do not exempt the contractor from responsibility for vegetation other than grass, such as trees and shrubs, in accordance with GC-9 of these specifications.

e. The following areas shall be treated as specified herein.

(1) Class A Seedbed, Class A Seed.

(a) Service areas (Utility Building and Parking Lot) and Operator's Quarters residence area.

(b) Turnaround and flagpole area, west end of dam.

(2) Class B Seedbed, Class B Seed.

(a) All road slopes, except as noted in subparagraph 43-06e (1) above or otherwise indicated.

(b) Cut slopes in earth above the rock surface along both the flood control intake and spillway channel, except below permanent pool elevation.

(3) Class C Seedbed, Class B Seed. All slopes and disturbed areas comprising and adjacent to Borrow Area "B". The applicable provisions of the EXCAVATION section of these specifications generally cover the requirements in the treatment of Borrow Area "B".

(4) Class D Seedbed, Class B Seed. The area comprising and adjacent to the spoil area on the upstream toe of the dike.

43-07. PREPARATION OF SUBGRADE. - a. General. - The area to be topsoiled and areas requiring other treatments are shown on the drawings and described in Paragraph 43-06 of this section of the specifications. Equipment necessary for the proper preparation of the ground surface and for handling and placing all materials required shall be on hand, in good condition, and shall be approved by the Contracting Officer before the work is started. Prior to grading and tillage operations, all heavy growth of vegetation of the areas to be treated sufficient to interfere with grading or tillage operations shall be mowed, grubbed, and raked, and burned or removed from the site. Prior to or during grading and tillage operations, the ground surface shall be cleared of all stumps, large stones, roots, cable, wire, grade stakes, and any other materials which might hinder proper grading, tillage or subsequent maintenance operations.

b. Grading. - Grades on the areas to be topsoiled which have been previously established, as shown on the drawings, shall be maintained in a true and even condition. Maintenance shall include any necessary repairs to previously graded areas. Where the grades have not been established, the areas shall be graded as shown on the drawings, and all surfaces shall be left at the prescribed grades in an even and properly compacted condition so as to prevent the formation of depressions where water will stand.

c. Tillage. - After the areas required to be treated have been brought to the proper subgrade parallel to the finished grades shown on the drawings, and immediately prior to dumping and spreading Class A and Class B topsoil, or prior to seeding if no topsoil is required, the subgrade shall be loosened by disking, or by scarifying to a depth of at least 2 inches, to permit bonding of the topsoil to the subgrade. On banks and inclines, the subgrade finish shall be loosened by harrowing in rows parallel to the contours of the slope. All other equipment to be employed on such slopes shall be operated similiarly.

d. Approval. - There shall be no application of topsoil made without the prior approval of the finished subgrade by the Contracting Officer.

43-08. PLACING TOPSOIL. - The topsoil shall be uniformly distributed on the areas designated, and evenly spread, and in sufficient depth to compensate for any shrinkage, so that the thickness of the compacted topsoil shall be as provided by the drawings and by the provisions of other paragraphs of this section of the specifications. Topsoil shall be compacted with two coverages of the treads of a crawler type tractor. The topsoil depth shall be measured perpendicular to the plane of the finished grade. The spreading shall be performed in such a manner that fine grading, fertilizing, liming and seeding can proceed with little additional soil preparation or tillage. Any irregularities in the surface resulting from operations thereon shall be corrected to prevent the formation of depressions where water will stand. Topsoil shall not be placed or worked when it or the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to the proposed seeding or to proper grading. Topsoiling shall be performed only when it can be followed within a reasonable time by seeding. In the borrow area, the spreading of stripping material (Class B topsoil and Class C topsoil) will not be required on bedrock slopes steeper than 3 horizontal on 1 vertical or on bedrock ridges or knobs of sufficient irregularity to require special construction methods for the spreading of stripping material. In borrow area B, the spreading of stripping material will not be required on extensive surfaces of exposed rock.

43-09. PREPARATION OF SEEDBED. - a. General. - It shall be demonstrated to the Contracting Officer before starting work that the application of fertilizers, lime, and seed required will be made uniformly and at the specified rates.

b. Fine Grading. - The seedbed shall be brought to the required finished grades, free from unsightly variations, lumps, ridges, and depressions. During such operations and prior to seeding, the surface of areas receiving class A topsoil, shall be cleared of all stumps, stones and other objects having a dimension of 1 inch or more, and a finely pulverized seedbed shall be formed. Areas receiving class B and class C topsoil shall have the surface reasonably clean and free from stumps, stones and other material which might injure development of maintenance of vegetative cover. Class D seedbeds shall be cleaned of debris and other material of objectionable size.

c. Application of Fertilizer and Lime. - Fertilizer and lime shall be distributed uniformly over the areas specified to be topsoiled and seeded, in accordance with the following schedule.

(1) Areas having Class A seedbed with Class A seed, and Class B seedbed with Class B seed.

Fertilizer	1000 lbs/acre
Lime	2 tons/acre

(2) Borrow Area B. - Class C, seedbed, Class B seed.
Lime, 1,500 lbs per acre applied hydraulically.
Fertilizer, 10-6-4, 1000 lbs/acre applied hydraulically.

(3) Class D seedbed, Class B seed.

Fertilizer	800 lbs/acre
Lime	2 tons/acre

Each material shall be incorporated independently into the top 3 inches of soil by disking, harrowing, drill, or other methods acceptable to the Contracting Officer during fine grading operations, or in combination without lime by floss-sprayer after the bulk of fine grading work has been done. Distribution of fertilizer and seed may be accomplished simultaneously by means of an approved seed drill equipped to sow seed and distribute fertilizer at the same time, or by floss-sprayer, at the appropriate stage for seeding operations. All materials must be applied hydraulically to Borrow Area B.

d. Leveling. - Any undulation or irregularities in the surface resulting from tillage, fertilizing, liming, or other operations shall be leveled out before seeding operations are begun. No seeding shall be done until the prepared seedbed has been approved by the Contracting Officer.

43-10. PLANTING SEED. - a. General. - All seeding work shall be done between the dates of 15 April and 1 June or between 15 August and 15 September unless otherwise directed in writing by the Contracting Officer. A method of sowing satisfactory to the Contracting Officer shall be employed, making use of approved mechanical power-drawn drills or seeders, mechanical hand-seeders, floss-sprayers, or other approved methods. When drills are used, provision shall be made by markers or other means to assure that the successive seeded strips will overlap or be separated by a space no greater than the space between the rows planted by the equipment being used. When delays in operation carry the work beyond the most favorable planting season for the species designated, or when conditions are such, by reason of drought, high winds, excessive moisture, or other factors, that satisfactory results are not likely to be obtained, the Contracting Officer will stop the work, and work shall be resumed only when conditions are favorable again or when approved alternate corrective measures and procedures have been put into effect. If inspection during seeding operations or after there is a show of green indicates that strips wider than the space between the rows planted have been left, or other areas skipped or too sparsely seeded, the Contracting Officer may require corrective work and the sowing of additional seed on such areas.

b. Treatment of Borrow Area B. - Treatment of Borrow Area B shall be accomplished in increments. During the fall 1963 planting season, that portion of the Borrow Area where excavation has been completed shall be trimmed and graded to meet the requirements of these specifications, shall have stripping material as specified hereinbefore, and shall be seeded as required.

c. Rates. - (1) Seed shall be sown at the following minimum rates.

Class A Seed:	4 lbs/1000 sq. ft.
Class B Seed:	120 lbs/acre

d. Broadcast Seeding. - Seed shall be broadcast by approved sowing equipment. The seed shall be uniformly distributed over the designated areas. Half the seed shall be sown with the sower moving in one direction, and the remainder shall be sown with the sower moving at right angles to the first sowing. The seed shall be covered to an average depth of 1/4 inch by means of a brush harrow, chain harrow, cultipacker, or other approved device. Broadcast seeding shall not be done during windy weather.

e. Drill Seeding. - Drill seeding shall be done with approved equipment with drills not more than 2 inches apart. The seed shall be sown uniformly over the designated areas, and covered to an average depth of 1/4 inch concurrently with the sowing.

f. Floss Spraying. - The application of fertilizer and seed may be accomplished in one operation by the use of an approved spraying machine. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The spraying equipment shall be so designed that when the solution is sprayed over an area resulting deposits of fertilizer and seed shall be equal in quantity to those quantities specified herein. In no case shall lime be sprayed simultaneously with fertilizer and seed, nor shall any materials be used that have been standing in solution for a period exceeding 8 hours. After the spraying has been accomplished, the surface of the loam shall be rolled as specified below. If the results of the spraying operation are unsatisfactory, the contractor will be required to abandon this method and to apply the materials as described hereinbefore.

43-11. COMPACTING. - Immediately after the operations specified above have been completed, the entire area, except floss sprayed areas, shall be compacted by means of a cultipacker, roller, or other approved equipment weighing 60 to 90 pounds per linear foot of roller. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, a pneumatic roller (not wobble-wheel) will be required. The pneumatic roller shall have tires of sufficient size so that complete coverage of the soil surface is obtained. When a cultipacker or similar equipment is used, the final rolling shall be at right angles to the existing slopes to prevent water erosion or at right angles to the prevailing wind to prevent dust, as directed by the Contracting Officer.

43-12. APPLYING MULCH. - The mulch shall be spread uniformly in a continuous blanket, as follows: Straw, or hay, at the rate of 2 tons per acre. The mulch shall be spread by hand or by use of a manure spreader, a modified grain combine with straw-spreader attachment, or other suitable equipment. Mulching shall be started at the upper part of a slope, and shall continue uniformly until the area is completely covered.

43-13. SECURING MULCH. - Immediately following the spreading of the mulch, the material shall be anchored to the soil by a V-type-wheel landpacker, a disk harrow set to cut only slightly, a rotary hoe run backwards, or other suitable equipment which will secure the mulch firmly in the ground to form a soil-binding mulch and prevent loss or bunching by wind. The number of passes over the mulch needed to secure it firmly to the soil shall be as determined by the Contracting Officer, but shall in no case exceed three passes. On slopes where machinery cannot be used, mulch shall be retained in place by a shallow covering of earth, by pressing into the soil at 18 inch intervals with a spade or other approved tool, by twine, stakes, or brush, or by other suitable means which will not be detrimental to subsequent maintenance.

43-14. PROTECTION. - The area shall be protected against traffic or other use by erecting barricades or a substantial wire and stake enclosure immediately after seeding and mulching operations have been completed, and by placing warning signs of a type approved by the Contracting Officer on the completed areas. The contractor shall repair any damage resulting from his operations. All mulch material which has been removed from the site by wind or from other causes shall be replaced and secured. Repair work which is required because of the contractor's negligence shall be performed without cost to the Government.

43-15. CLEAN-UP. - The contractor shall leave each area neat and clean, with adjacent turf and tree-covered areas raked of extraneous matter, and with all debris, removed from the site. Any paved area over which hauling operations are conducted shall be kept clean and any topsoil, mulch, clippings, or other approved materials which may be brought upon the paved surface shall be removed promptly.

43-16. ESTABLISHEMENT. - a. General. - The contractor shall be responsible for the proper care of the seeded areas during the period when the grass is becoming established including watering. This period shall extend for 45 days after the completion of the seeding on the entire project, if seeding is completed during the Spring seeding season. When seeding is completed during the Fall seeding season, the maintenance period shall extend until May 15 of the succeeding year.

b. Watering. - All seeded areas shall be watered during the establishment period whenever considered necessary by the Contracting Officer. Seeded areas on which grout has started shall be watered to a minimum depth of 2 inches to assure continuing growth. Watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment.

c. Mowing. - The seeded areas, except borrow areas, shall be mowed with approved mowing equipment to a height of 2 inches when the average height of grass becomes 4 inches for initial mowing and 3 inches for all subsequent mowings. If weeds or other undesirable vegetation threatens to smother the planted species, such vegetation shall be mowed or, in the case of exceedingly rank growth, be uprooted, raked, and removed from the area.

d. Refertilizing and Reseeding. - Areas which, in the opinion of the Contracting Officer, fail to show a good growth of grass during the period of establishment cited above shall be refertilized and reseeded. Areas that require refertilization and reseeding will be designated by the Contracting Officer at least 15 days prior to the period specified for the next seeding season. The fertilizer shall be distributed on the areas to be reseeded during a period when the surface is dry. Reseeding shall be done in a manner that will cause a minimum of disturbance to the existing stand of grass. The fertilizer and seed shall be of the same grade, physical condition, packaging and marking, and shall be applied at the rates specified hereinbefore.

e. Mulch. - Mulch shall be removed if and when it is required by the Contracting Officer.

43-17. REPAIR. - When any portion of the surface becomes gullied, eroded, or otherwise damaged following seeding and mulching, or the seedlings have been winter-killed or otherwise destroyed through no fault of the contractor, the contractor shall, within 15 days of written notice by the Contracting Officer, restore the damaged portions to re-establish the condition of the finished grade prior to seeding. The area shall then be refertilized, reseeded and mulched as specified herein, and an equitable adjustment made in the contract price. The provisions of this paragraph become applicable only after all other requirements of this section of the specifications have been completed.

43-18. COVER SEEDING. - Cover seeding, when required, will be accomplished without fine grading, fertilizer or liming operations. The seed shall consist of Hairy Vetch or Common Buckwheat, applied at the rate of 60 pounds per acre. If cover seeding is required, together with the reconstruction of the turf bed and subsequent grass seeding in accordance with this specification, an equitable adjustment in the contract price will be made.

43-19. ADDITIONAL MULCHING. - When required by the Contracting Officer, slopes less than 1 on 5 and flat areas shall be mulched as specified herein, and an equitable adjustment will be made in the contract price.

43-20. MEASUREMENT AND PAYMENT. - a. Topsoil. - No separate payment will be made for stripping, stockpiling, transporting or placing topsoil, and all costs in connection therewith will be considered as operations subsidiary to the requirements of the Section, EXCAVATION, of these specifications.

b. Seeding. - Payment will be made for seeding on the basis of the number of square yards of seeding measured as specified in Paragraph 43-20c, acceptably done, computed from the neat lines and grades indicated on the drawings or as stated in the field. Payment for seeding will be made at the contract unit price per square yard, which price shall include all cost of preparation of subgrade and/or seedbed, grading, application of fertilizer and lime, grading, seeding, mulching, establishment, repair, and the furnishing of all labor, materials including seed, fertilizer, lime, mulch, equipment and incidentals necessary to complete the seeding. Payment will be made on the basis of the following types of seedbed and/or seed application actually completed.

(1) Class A Seedbed, Class A Seed. (Item 105)

(2) Class B Seedbed, Class B Seed. (Item 106)

(3) Class D Seedbed, Class B Seed. (Item 107)

c. Measurement. - Measrrement of areas to be seeded, as specified in Paragraph 43-20b above will be made as follows.

(1) On slopes of surfaces to be seeded, measurement shall be made normal to and parallel to the slopes, and the actual area computed.

(2) Measurement of all other areas shall be computed by measuring their horizontal projections.

d. The payment for topsoiling or seeding does not include compensation for clearing and grubbing which is paid for in accordance with Section 1 or as subsidiary to borrow excavation. The payments for topsoiling or seeding does not include compensation for topsoiling or seeding for areas specified in Paragraphs 43-06b, c, and d. and 43-06e(3), and all costs in connection therewith shall be considered as a subsidiary obligation of the contractor.

e. No separate payment will be made for topsoiling and seeding the borrow area B. All costs in connection with seeding, fertilizing, furnishing seed and fertilizer, and all work in connection with topsoiling, seeding and fertilizing the borrow area shall be included in the contract unit price for Item No. 4, "Unclassified Excavation, Borrow 'B'".

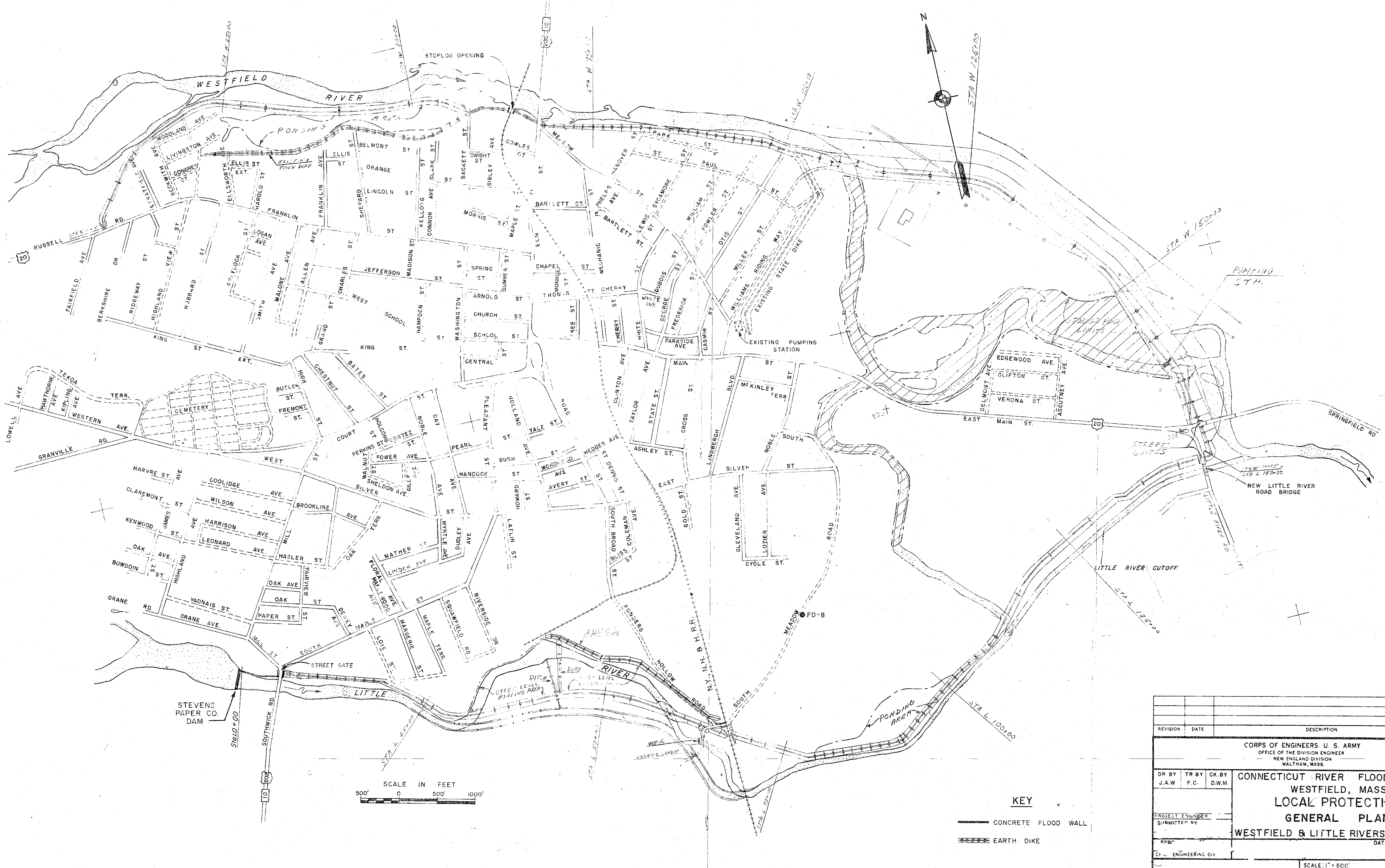
f. The quantities and types of lime, fertilizer and seed specified indicate anticipated average requirements. In the event changes are necessary in quantities or type of materials, a suitable adjustment to the contract will be made to cover the changes.

g. In the event repairs, as specified in Paragraph 43-17, are required due to no fault of the contractor, an equitable adjustment will be made to the contract.

h. In the event cover seeding is required, as specified in Paragraph 43-18, an equitable adjustment will be made to the contract.

CORPS OF ENGINEERS

U.S. ARMY



REVISION	DATE	DESCRIPTION	BY

CORPS OF ENGINEERS U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY
J.A.W	F.C.	D.W.M.

CONNECTICUT RIVER FLOOD CONTROL
WESTFIELD, MASS
LOCAL PROTECTION
GENERAL PLAN
WESTFIELD & LITTLE RIVERS MASS.

PROJECT ENGINEER

SUBMITTED BY

APPR.

CH. ENGINEERING DIV.

DATE JUNE 1963

SCALE: 1" = 500'

DRAWING NUMBER

SHEET 1 OF 1

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM 54, MASS.

ADDRESS REPLY TO:
DIVISION ENGINEER

REFER TO FILE NO.
NEDGB

2 July 1963

Hampden County Commissioners
37 Elm Street
Springfield, Massachusetts

Gentlemen:

This office is currently in the process of designing the Westfield Local Protection Project, in the City of Westfield, Massachusetts. The General Design Memorandum is scheduled for submission in September 1963.

This project is located in the City of Westfield, Hampden County, Massachusetts. It is approximately 11 miles west of Springfield, Massachusetts, 43 miles east of Pittsfield, Massachusetts, and about 30 miles north of Hartford, Connecticut. It extends along the south bank of the Westfield River and along the north bank of the Little River within the City. The project provides for the construction of earth dikes and floodwalls along the Westfield and Little Rivers, excavation of cutoff channels on both rivers, construction of a pumping station, and appurtenant works.

Two new channels will be excavated, one cutting off the oxbow on the Westfield River and the other straightening the Little River. The Westfield River cutoff, 7000 feet long, will start approximately 3200 feet downstream from the Elm Street Bridge. The Little River cutoff, 4100 feet long, will start approximately 4000 feet downstream from the New York, New Haven and Hartford Railroad Bridge over the Little River and extend to its new confluence with the Westfield River just downstream from the Springfield Road (Route 20) Bridge. A new bridge will be required where Little River Road (Route 187) crosses the channel cutoff. The bottom widths of the cutoff channels will be 200 feet and 70 feet for the Westfield and Little Rivers, respectively.

There will be about 31,700 feet of dike necessary for the protection; 17,500 feet will be along the right bank of the Westfield River and its new channel. It will vary in elevation from 147 to 160 m.s.l.; 14,200 feet along the left bank of the Little River and its new channel, and this will vary from elevation 147.0 to 167 m.s.l. Use will be made of the existing dikes around the City. The top width will be 10 feet with 1 vertical to 2.5 horizontal riverside slope and 1 vertical to 2 horizontal landside slope.

There will be three (3) street gates required where the dike crosses existing ways: two will be required along the Little River dike, one at Route 20 & 202, and another at Little River Road. The third will be on Route 20, Springfield Road on the Westfield River. A railroad concrete stoplog structure will be provided where the New York, New Haven and Hartford railway crosses the dike on the right bank of the Westfield River. A 500-foot length of reinforced concrete wall at elevation 172.0 m.s.l. and an average height of 25 feet will be required to complete the tie into an existing dam (Stevens Mill Dam) just west of the Route 20 & 202 bridge crossing of the Little River on the left bank.

Two ponding areas will be provided behind the Westfield River dike for the storage of water from interior runoff and seepage during design conditions for the project. The main ponding area will utilize the existing stream bed of the Westfield and Little Rivers from which the river flow has been diverted due to realignment of the river channels. A pumping station will be provided and will be located just upstream of the Route 20 bridge crossing of the Westfield River. Under design conditions, water will pond to elevation 120 m.s.l. in this area. Another storage area will be available between the existing dike upstream of the New York, New Haven and Hartford railroad bridge crossing of the Westfield River and the new dike. Water will pond in this area to elevation 138.5 m.s.l. under design conditions. This area will be drained by gravity through a gated conduit.

Three ponding areas are proposed for the Little River drainage area. The existing river channel just upstream of the New York, New Haven and Hartford railroad bridge crossing of the Little River will be used as a storage area. This area will be divided into two areas separated by a dike. One pond will store water to elevation 140.5 and the other to elevation 147.5 under design conditions. These areas will be drained by gravity through gated conduits. A second area will be east of the New York, New Haven and Hartford railroad embankment adjacent to the toe of the proposed dike. Water will pond in this area to elevation 134.5 feet m.s.l. under design conditions. A gated conduit will be provided to drain this area.

Your comments on the above proposal are requested. There is attached one print of the proposed plan.

Sincerely yours,

Eugene Groden

JOHN WM. LESLIE
Chief, Engineering Division

Incl
Print

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND *CONSULTING ENGINEERS*

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Westfield
July 22, 1963.

The Hon. the Board of County Commissioners
37 Elm Street
Springfield, Mass.

Gentlemen:

Reference is made to the communication from the U. S. Army Engineer Division, New England Corps of Engineers, dated 2 July 1963 and to the plan submitted with the letter showing proposed local flood protection for Westfield, Mass.

The communication and the plan show the general method for providing improved flood protection for the City of Westfield from flood waters carried by the Westfield River and by Little River. A description of the flood protection work is contained in the communication.

I have reviewed the communication and the plan and have made a very preliminary study of the proposed flood protection work, together with the storage ponds for storing surface water within the protected area. The only conflict between the letter and the drawing is the reference to Route 20 and Route 202 bridge crossing, as well as street gate at Little River and its proposed dikes. The letter should have referred to Route 10 and 202, rather than Route 20 and 202.

I am of the opinion that the work as proposed, does not come under the jurisdiction of the County, except perhaps for the storage ponds behind the dikes. However, in the past, I do not recall that the Corps of Engineers have filed plans for storage ponds in connection with dikes constructed for communities throughout the County. It might be well, however, to ask the Corps of Engineers to keep you informed of the progress of the work and to file plans with you of the storage ponds, their related dikes and other facilities.

A suggested communication to the U.S. Army Engineer Division, New England Corps of Engineers, is enclosed.

I am returning to you enclosed, the communication received by your Board and the copy of the plan of the proposed flood protection work.

Very truly yours

GHMcDonnell

George H. McDonnell
County Hydraulic Engineer

GHM/cmb
enc.

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

PLANS FOR THE

CONSTRUCTION OF DAM

AND

APPURTENANT STRUCTURES

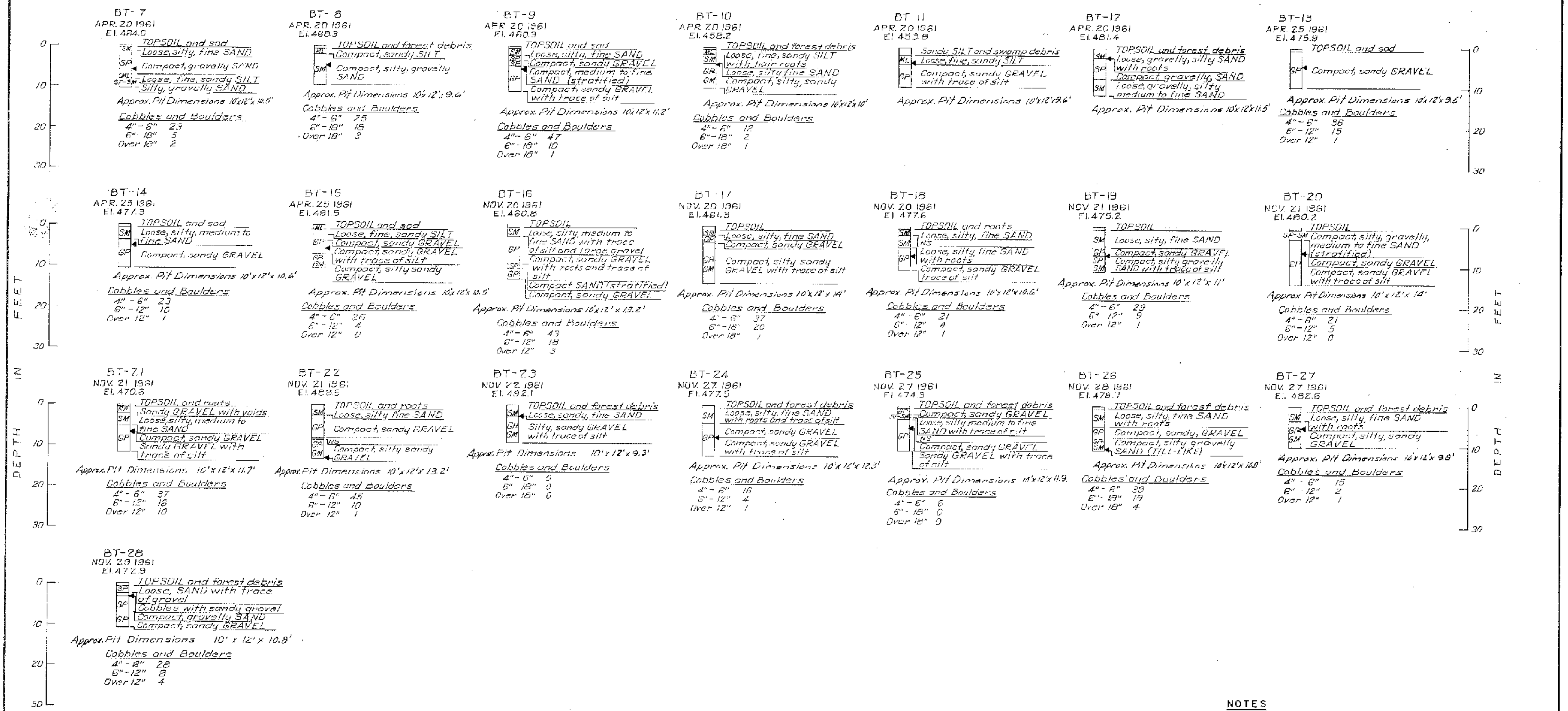
U.S. Army Engineer Division, New England
Corps of Engineers Waltham, Mass.

MARCH 1962

All drawings in this folio have been reduced to one half the original scale.

CORPS OF ENGINEERS

U. S. ARMY



NOTES

Elevations refer to Mean Sea Level Datum.
For Location of Borrow Explorations sheets 20 and 21.
For Legend of Graphic Logs and applicable notes see sheet No. 14.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.A.V. | DR. BY R.D.B. | CK. BY H.A.V.

SUBMITTED R. C. Gurley
HEAD, GEOLOGY SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, FDN & MAT'LS BRANCH

APPROVAL RECOMMENDED
CHIEF, PLANN'G & R'TS BRANCH

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

RECORD OF BORROW EXPLORATIONS NO. 3

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

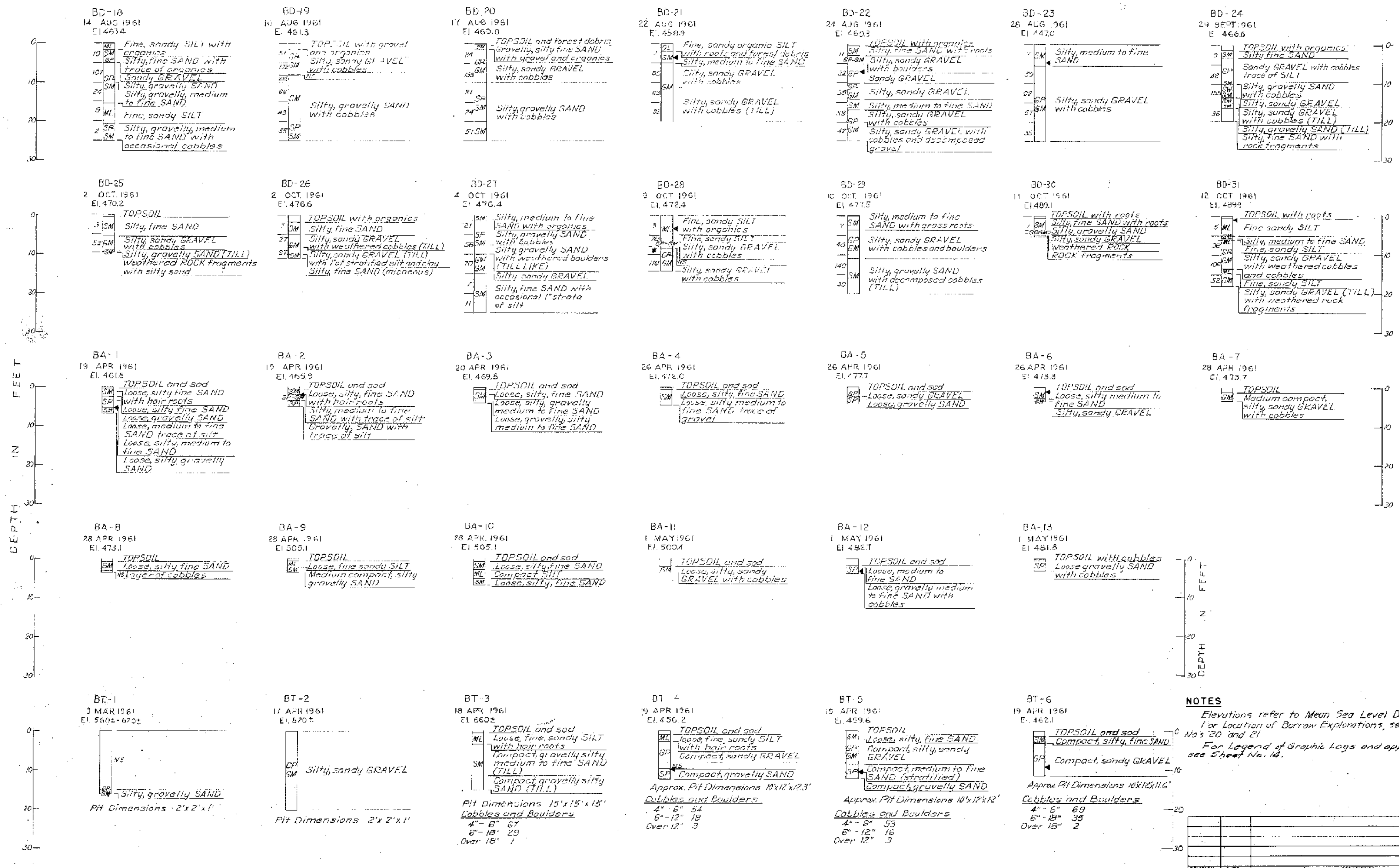
SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-2-1508

SHEET 24

CORPS OF ENGINEERS

U. S. ARMY


BD-18
14 AUG 1961
El 463.4
Fine, sandy SILT with organics
Silty, fine SAND with trace of organics
Sandy GRAVEL
Silty, gravelly SAND
Silty, gravelly, medium to fine SAND
Fine, sandy SILT
Silty, gravelly, medium to fine SAND with occasional cobbles
BD-19
16 AUG 1961
El. 461.3
TOPSOIL with gravel and organics
Silty, sandy GRAVEL with cobbles
Silty, gravelly SAND with cobbles
BD-20
17 AUG 1961
El 460.8
TOPSOIL and forest debris
Gravelly, silty fine SAND with gravel and organics
Silty, sandy GRAVEL with cobbles
Silty, gravelly SAND with cobbles
BD-21
22 AUG 1961
El. 458.9
Fine, sandy organic SILT with roots and forest debris
Silty, medium to fine SAND
Silty, sandy GRAVEL with cobbles
Silty, sandy GRAVEL with cobbles (TILL)
BD-22
24 AUG 1961
El 460.3
TOPSOIL with organics
Silty, fine SAND with roots
Silty, sandy GRAVEL with boulders
Sandy GRAVEL
Silty, sandy GRAVEL
Silty, medium to fine SAND
Silty, sandy GRAVEL with cobbles
Silty, sandy GRAVEL with cobbles and decomposed gravel
BD-23
28 AUG 1961
El 447.0
Silty, medium to fine SAND
Silty, sandy GRAVEL with cobbles
BD-24
29 SEPT 1961
El 466.6
TOPSOIL with organics
Silty fine SAND
Sandy GRAVEL with cobbles trace of SILT
Silty, gravelly SAND with cobbles
Silty, sandy GRAVEL
Silty, sandy GRAVEL with cobbles (TILL)
Silty, gravelly SAND (TILL)
Silty, fine SAND with rock fragments
BD-25
2 OCT. 1961
El. 470.2
TOPSOIL
Silty, fine SAND
Silty, sandy GRAVEL with cobbles
Silty, gravelly SAND (TILL)
Weathered ROCK fragments with silty sand
BD-26
2 OCT. 1961
El. 476.6
TOPSOIL with organics
Silty, fine SAND
Silty, sandy GRAVEL with weathered cobbles (TILL)
Silty, sandy GRAVEL (TILL) with 1" of stratified silt and clay
Silty, fine SAND (micaceous)
BD-27
4 OCT 1961
El 476.4
Silty, medium to fine SAND with organics
Silty, gravelly SAND with cobbles
Silty gravelly SAND with weathered boulders (TILL LIKE)
Silty sandy GRAVEL
Silty, fine SAND with occasional 1" strata of silt
BD-28
9 OCT 1961
El. 472.4
Fine, sandy SILT with organics
Fine, sandy SILT
Silty, sandy GRAVEL with cobbles
Silty, sandy GRAVEL with cobbles
BD-29
10 OCT. 1961
El 477.5
Silty, medium to fine SAND with grass roots
Silty, sandy GRAVEL with cobbles and boulders
Silty, gravelly SAND with decomposed cobbles (TILL)
BD-30
11 OCT 1961
El 489.1
TOPSOIL with roots
Silty, fine SAND with roots
Silty, gravelly SAND
Silty, sandy GRAVEL
Weathered ROCK
ROCK fragments
BD-31
12 OCT 1961
El. 489.9
TOPSOIL with roots
Fine sandy SILT
Silty, medium to fine SAND
Fine, sandy SILT
Silty, sandy GRAVEL with weathered cobbles and cobbles
Fine, sandy SILT
Silty, sandy GRAVEL (TILL) with weathered rock fragments
BA-1
19 APR 1961
El. 461.6
TOPSOIL and sod
Loose, silty fine SAND with hair roots
Loose, silty fine SAND
Loose, gravelly SAND
Loose, medium to fine SAND trace of silt
Loose, silty, medium to fine SAND
Loose, silty, gravelly SAND
BA-2
19 APR 1961
El. 465.9
TOPSOIL and sod
Loose, silty, fine SAND with hair roots
Silty, medium to fine SAND with trace of silt
Gravelly, SAND with trace of silt
BA-3
20 APR 1961
El. 469.8
TOPSOIL and sod
Loose, silty, fine SAND
Loose, silty, gravelly medium to fine SAND
Loose, gravelly, silty medium to fine SAND
BA-4
26 APR 1961
El. 472.0
TOPSOIL and sod
Loose, silty, fine SAND
Loose, silty medium to fine SAND trace of gravel
BA-5
26 APR 1961
El. 477.7
TOPSOIL and sod
Loose, sandy GRAVEL
Loose, gravelly SAND
BA-6
26 APR 1961
El 473.3
TOPSOIL and sod
Loose, silty medium to fine SAND
Silty, sandy GRAVEL
BA-7
28 APR 1961
El. 473.7
TOPSOIL
Medium compact, silty, sandy GRAVEL with cobbles
BA-8
28 APR 1961
El. 473.1
TOPSOIL
Loose, silty fine SAND
Layer of cobbles
BA-9
28 APR 1961
El 505.1
TOPSOIL
Loose, fine sandy SILT
Medium compact, silty gravelly SAND
BA-10
28 APR. 1961
El 505.1
TOPSOIL and sod
Loose, silty, fine SAND
Compact SILT
Loose, silty, fine SAND
BA-11
1 MAY 1961
El. 500.4
TOPSOIL and sod
Loose, silty, sandy GRAVEL with cobbles
BA-12
1 MAY 1961
El 482.7
TOPSOIL and sod
Loose, medium to fine SAND
Loose, gravelly medium to fine SAND with cobbles
BA-13
1 MAY 1961
El 481.8
TOPSOIL with cobbles
Loose gravelly SAND with cobbles
BT-1
3 MAR 1961
El. 560±-670±
Silty, gravelly SAND
Pit Dimensions 2'x 2'x 1'
BT-2
17 APR 1961
El. 570±
Silty, sandy GRAVEL
Pit Dimensions 2'x 2'x 1'
BT-3
18 APR 1961
El. 660±
TOPSOIL and sod
Loose, fine, sandy SILT with hair roots
Compact, gravelly silty medium to fine SAND (TILL)
Compact gravelly silty SAND (TILL)
Pit Dimensions 15'x 15'x 15'
Cobbles and Boulders
4"-6" 67
6"-18" 29
Over 18" 1
BT-4
19 APR 1961
El. 456.2
TOPSOIL and sod
Loose, fine, sandy SILT with hair roots
Compact, sandy GRAVEL
Compact, gravelly SAND
Approx. Pit Dimensions 10'x 12'x 12.3'
Cobbles and Boulders
4"-6" 54
6"-12" 19
Over 12" 3
BT-5
19 APR 1961
El. 459.6
TOPSOIL
Loose, silty, fine SAND
Compact, silty, sandy GRAVEL
Compact, medium to fine SAND (stratified)
Compact, gravelly SAND
Approx. Pit Dimensions 10'x 12'x 12'
Cobbles and Boulders
4"-6" 53
6"-12" 16
Over 12" 3
BT-6
19 APR 1961
El. 462.1
TOPSOIL and sod
Compact, silty, fine SAND
Compact, sandy GRAVEL
Approx. Pit Dimensions 10'x 12'x 11.6'
Cobbles and Boulders
4"-6" 69
6"-18" 35
Over 18" 2
DEPTH IN FEET
0
10
20
30

NOTES

Elevations refer to Mean Sea Level Da.

For Location of Borrow Explorations, see sheet No's 20 and 21

For Legend of Graphic Logs and applicable notes see Sheet No. 14.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.A.V. DR. BY R.D.B. CK. BY H.A.V.

SUBMITTED R.C. Gurley
HEAD, GEOLOGY SECTION

PROJECT ENGINEER Hartley

APPROVAL RECOMMENDED
CHIEF, FDN & MAT'LS BRANCH

APPROVAL RECOMMENDED Dingwall
CHIEF, PLAN'G & R'PTS BRANCH

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

RECORD OF BORROW EXPLORATIONS
NO. 2

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION

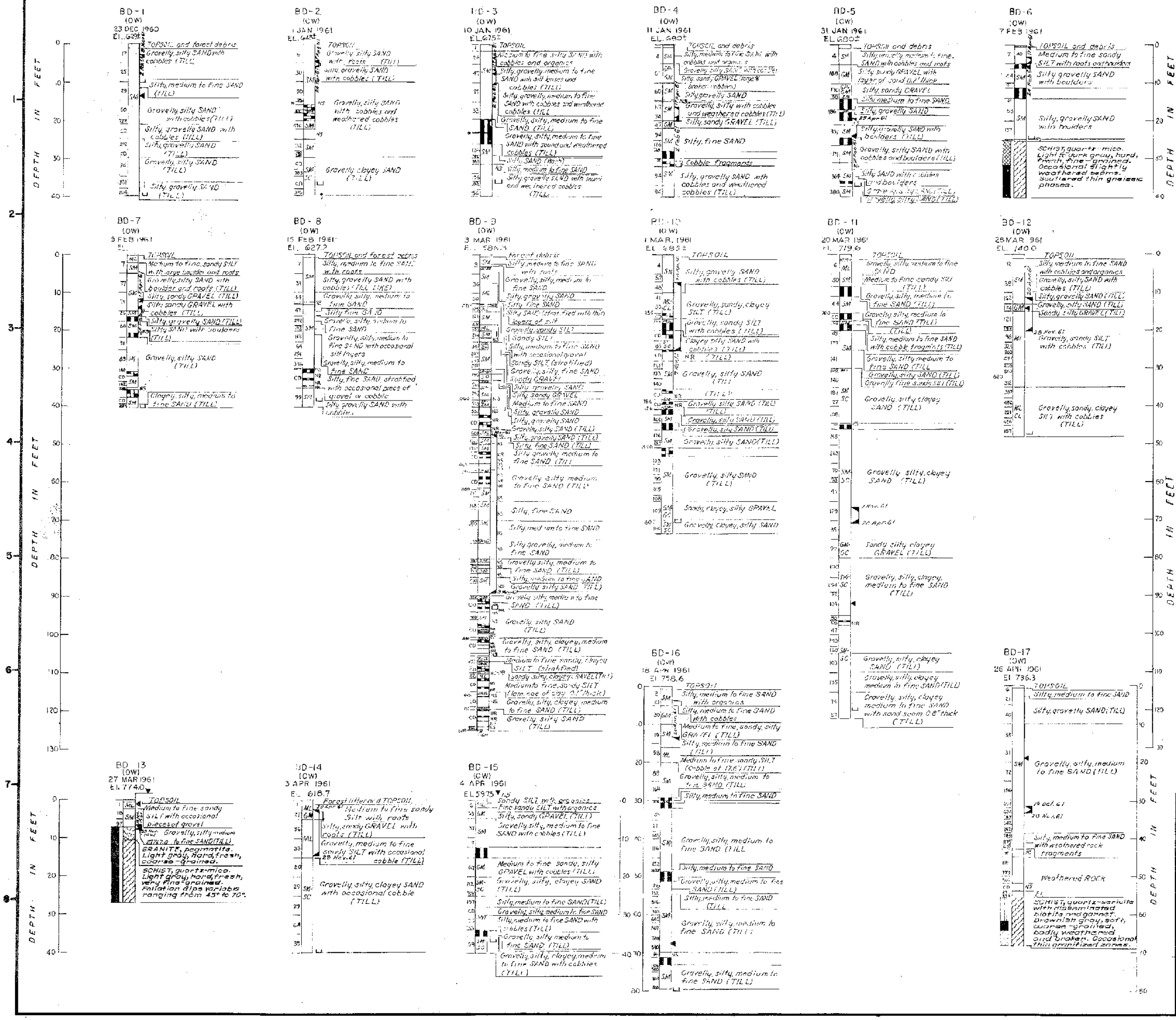
DATE MARCH 1962

SCALE AS SHOWN

SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-2-1507

SHEET 23


A
B
C
D
E
F
G
H
1
2
3
4
5
6
7
8
DEPTH IN FEET
BD-1
(OW)
23 DEC 1960
EL. 629±
TOPSOIL and forest debris
Gravelly, silty SAND with cobbles (TILL)
Silty, medium to fine SAND (TILL)
Gravelly silty SAND with cobbles (TILL)
Silty, gravelly SAND with cobbles (TILL)
Silty, gravelly SAND (TILL)
Gravelly, silty SAND (TILL)
Silty, gravelly SAND (TILL)
BD-2
(OW)
1 JAN 1961
EL. 645±
TOPSOIL
Gravelly silty SAND with roots (TILL)
Silty, gravelly SAND with cobbles (TILL)
Gravelly, silty SAND with cobbles and weathered cobbles (TILL)
Gravelly clayey SAND (TILL)
BD-3
(OW)
10 JAN 1961
EL. 675±
TOPSOIL
Medium to fine silty SAND with cobbles and organics
Silty, gravelly, medium to fine SAND with silt lenses and cobbles (TILL)
Silty, gravelly, medium to fine SAND with cobbles and weathered cobbles (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Gravelly, silty, medium to fine SAND with sound and weathered cobbles (TILL)
Silty SAND (Wash)
Silty, medium to fine SAND
Silty, gravelly SAND with sound and weathered cobbles (TILL)
BD-4
(OW)
11 JAN 1961
EL. 680±
TOPSOIL and debris
Silty, medium to fine SAND with cobbles and organics
Gravelly silty SAND with cobbles
Silty, sandy GRAVEL (large % broken cobbles)
Silty gravelly SAND
Gravelly, silty with cobbles and weathered cobbles (TILL)
Silty, sandy GRAVEL (TILL)
Silty, fine SAND
Cobble fragments
Silty, gravelly SAND with cobbles and weathered cobbles (TILL)
BD-5
(OW)
31 JAN 1961
EL. 680±
TOPSOIL and debris
Silty, gravelly, medium to fine SAND with cobbles and roots
Silty sandy GRAVEL with layer of sand 0.2' thick
Silty, sandy GRAVEL
Silty medium to fine SAND
Silty, gravelly SAND
Silty, gravelly SAND with boulders (TILL)
Gravelly, silty SAND with cobbles and boulders (TILL)
Silty SAND with cobbles and boulders
Gravelly, silty SAND (TILL)
BD-6
(OW)
7 FEB 1961
TOPSOIL and debris
Medium to fine sandy SILT with roots and boulders
Silty gravelly SAND with boulders
Silty, gravelly SAND with boulders
SCHIST, quartz-mica. Light to dark gray, hard, fresh, fine-grained. Occasional slightly weathered seams. Scattered thin gneissic phases.
BD-7
(OW)
9 FEB 1961
EL.
TOPSOIL
Medium to fine, sandy SILT with large boulder and roots
Gravelly, silty SAND with boulder and roots (TILL)
Silty, sandy GRAVEL with cobbles (TILL)
Silty, gravelly SAND (TILL)
Silty SAND with boulders (TILL)
Gravelly, silty SAND (TILL)
Clayey, silty, medium to fine SAND (TILL)
BD-8
(OW)
15 FEB 1961
EL. 627.2
TOPSOIL and forest debris
Silty, medium to fine SAND with roots
Silty, gravelly SAND with cobbles (TILL LIKE)
Gravelly, silty, medium to fine SAND
Silty, fine SAND
Gravelly, silty, medium to fine SAND
Gravelly, silty, medium to fine SAND with occasional silt layers
Gravelly, silty, medium to fine SAND
Silty, fine SAND stratified with occasional piece of gravel or cobble
Silty, gravelly SAND with cobbles
BD-9
(OW)
3 MAR 1961
EL. 586.3
Forest debris
Silty, medium to fine SAND with roots
Gravelly, silty, medium to fine SAND
Silty, gravelly SAND
Silty, fine SAND
Silty SAND (stratified with thin layers of silt)
Gravelly, sandy SILT
Sandy SILT
Silty, medium to fine SAND with occasional gravel
Sandy SILT (stratified)
Gravelly, silty, fine SAND
Sandy GRAVEL
Silty, gravelly SAND
Silty, sandy GRAVEL
Medium to fine SAND
Silty, gravelly SAND
Silty, gravelly SAND
Gravelly, silty SAND (TILL)
Silty, gravelly SAND (TILL)
Silty, fine SAND (TILL)
Silty, gravelly, medium to fine SAND (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Silty, fine SAND
Silty, medium to fine SAND
Silty, gravelly, medium to fine SAND
Gravelly, silty, medium to fine SAND (TILL)
Silty, medium to fine SAND
Gravelly, silty SAND (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Gravelly, silty SAND (TILL)
Gravelly, silty, clayey, medium to fine SAND (TILL)
Medium to fine sandy, clayey SILT (stratified)
Sandy, silty, clayey GRAVEL (TILL)
Medium to fine, sandy SILT (lenses of clay 0.1' thick)
Gravelly, silty, clayey, medium to fine SAND (TILL)
Gravelly, silty SAND (TILL)
BD-10
(OW)
1 MAR. 1961
EL. 685±
TOPSOIL
Silty, gravelly SAND with cobbles (TILL)
Gravelly, sandy, clayey SILT (TILL)
Gravelly, sandy SILT with cobbles (TILL)
Clayey, silty SAND with cobbles (TILL)
NR (TILL)
Gravelly, silty SAND (TILL)
Gravelly, silty SAND (TILL)
Gravelly, silty SAND (TILL)
Gravelly, silty SAND (TILL)
Gravelly, silty SAND (TILL)
Sandy, clayey, silty GRAVEL
Gravelly, clayey, silty SAND
BD-11
(OW)
20 MAR 1961
EL. 719.6
TOPSOIL
Gravelly, silty, medium to fine SAND
Medium to fine sandy SILT (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Silty, medium to fine SAND with cobble fragments (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Gravelly, silty SAND (TILL)
Gravelly, fine SAND (TILL)
Gravelly, silty, clayey SAND (TILL)
Gravelly, silty, clayey SAND (TILL)
Sandy, silty, clayey GRAVEL (TILL)
Gravelly, silty, clayey, medium to fine SAND (TILL)
Gravelly, silty, clayey SAND (TILL)
Gravelly, silty, clayey, medium to fine SAND (TILL)
Gravelly, silty, clayey medium to fine SAND with sand seam 0.8" thick (TILL)
BD-12
(OW)
28 MAR 1961
EL. 1400
TOPSOIL
Silty medium to fine SAND with cobbles and organics
Gravelly, silty SAND with cobbles (TILL)
Silty, gravelly SAND (TILL)
Gravelly, silty SAND (TILL)
Sandy, silty GRAVEL (TILL)
28 Nov. 61
Gravelly, sandy SILT with cobbles (TILL)
Gravelly, sandy, clayey SILT with cobbles (TILL)
BD-13
(OW)
27 MAR 1961
EL. 774.0
TOPSOIL
Medium to fine sandy SILT with occasional pieces of gravel
Gravelly, silty, medium to fine SAND (TILL)
GRANITE, pegmatite. Light gray, hard, fresh, coarse-grained.
SCHIST, quartz-mica. Light gray, hard, fresh, very fine-grained. Foliation dips variable ranging from 45° to 70°.
BD-14
(OW)
3 APR 1961
EL. 618.7
Forest litter and TOPSOIL
Medium to fine sandy Silt with roots
Silty, sandy GRAVEL with roots (TILL)
Gravelly, medium to fine sandy SILT with occasional cobble (TILL)
28 Nov. 61
Gravelly, silty, clayey SAND with occasional cobble (TILL)
BD-15
(OW)
4 APR 1961
EL. 597.5
Sandy SILT with organics
Fine sandy SILT with organics
Silty, sandy GRAVEL (TILL)
Gravelly, silty, medium to fine SAND with cobbles (TILL)
Medium to fine sandy, silty GRAVEL with cobbles (TILL)
Gravelly, silty, clayey SAND (TILL)
Silty, medium to fine SAND (TILL)
Gravelly, silty, medium to fine SAND
Silty, medium to fine SAND with cobbles (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Gravelly, silty, clayey, medium to fine SAND with cobbles (TILL)
BD-16
(OW)
18 APR 1961
EL. 758.6
TOPSOIL
Silty, medium to fine SAND with organics
Silty, medium to fine SAND with cobbles
Medium to fine, sandy, silty GRAVEL (TILL)
Silty, medium to fine SAND (TILL)
Medium to fine sandy SILT (cobble at 17.6') (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Silty, medium to fine SAND
Gravelly, silty, medium to fine SAND (TILL)
Silty, medium to fine SAND
Gravelly, silty, medium to fine SAND (TILL)
Silty, medium to fine SAND (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Gravelly, silty, medium to fine SAND (TILL)
BD-17
(OW)
26 APR 1961
EL. 736.3
TOPSOIL
Silty, medium to fine SAND
Silty, gravelly SAND (TILL)
Gravelly, silty, medium to fine SAND (TILL)
14 Oct. 61
28 Nov. 61
Silty, medium to fine SAND with weathered rock fragments
Weathered ROCK
SCHIST, quartz-sericite with disseminated biotite and garnet. Brownish gray, soft, coarse-grained, badly weathered and broken. Occasional thin granitized zones.

NOTES

Elevations refer to Mean Sea Level Datum.

For Legend of Graphic Logs and applicable notes, see Sheet No. 14

Borings BD-1 thru BD-7 inclusive, located in Area A Impervious. Borings BD-8 thru BD-17 inclusive, located in Area B Impervious.

For locations of Borrow Explorations see Sheet No's 20 and 21.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H.A.V.	R.A.W.	H.A.V.

SUBMITTED
H.C. Knowles
HEAD, GEOLOGY SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
ACTG CHIEF, FDN & MATLS BRANCH
APPROVAL RECOMMENDED
CHIEF, PLANNING & REPORTS BRANCH

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM
RECORD OF BORROW EXPLORATIONS
NO. 1

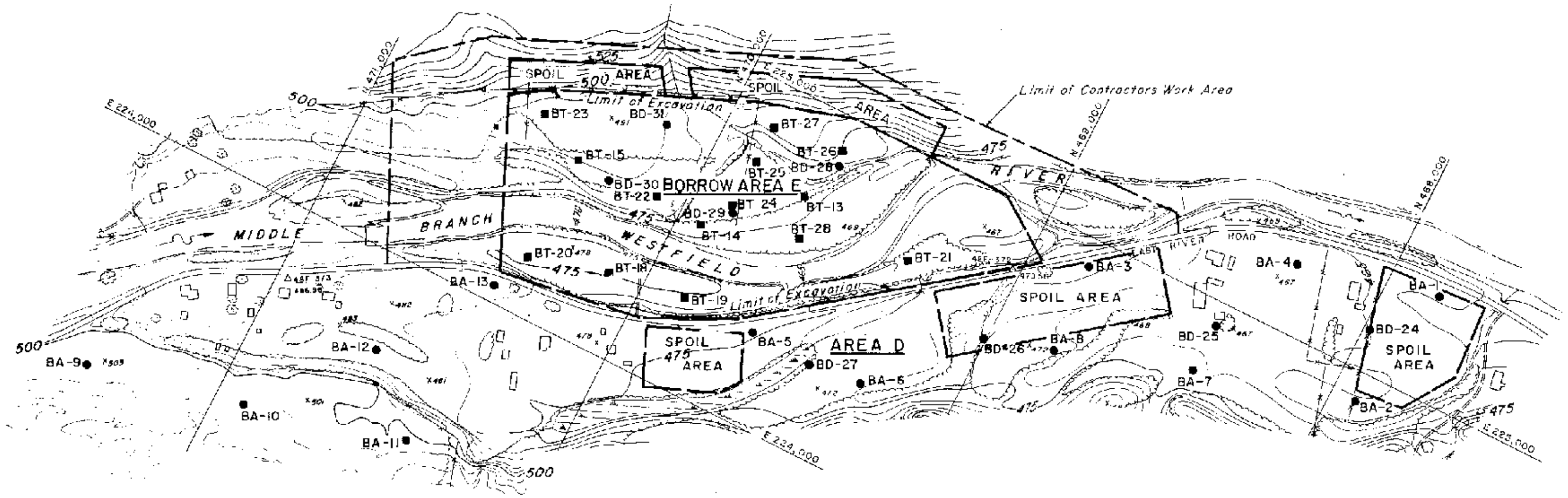
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-2-1506
SHEET 22

CORPS OF ENGINEERS

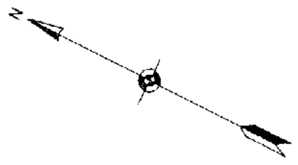
U. S. ARMY

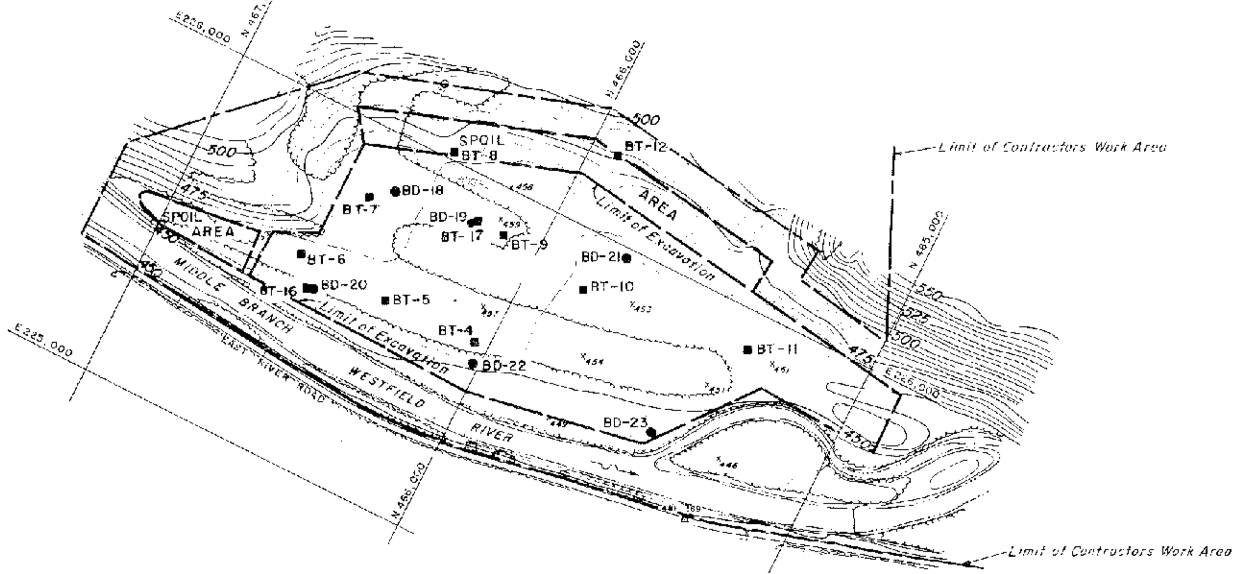


PLAN - BORROW AREA E AND AREA D

SCALE IN FEET

200 0 200 400





PLAN - BORROW AREA C

SCALE IN FEET

200 0 200 400

LEGEND

● BD Borrow Test Boring

● BA Borrow Hand Auger Boring

■ BT Borrow Test Pit

NOTES

Elevations refer to Mean Sea Level Datum.

Contour interval is 5 feet.

1000 foot Grid based on Massachusetts Plane Coordinate System.

Area D extends west of East River Road to El. 500. Contractor may obtain temporary construction fill material from this area except within 100 feet of occupied buildings

REVISION	DATE	DESCRIPTION	BY

U.S ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
J.H.	R.O.B.	J.H.

SUBMITTED
R. E. Gurley
HEAD, GEOLOGY SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
H. F. Shea
CHIEF, FDN & MAT'LS BRANCH

APPROVAL RECOMMENDED
CHIEF, PLAN'G & R'TS BRANCH

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

PLANS OF BORROW EXPLORATIONS AREAS C, D AND E

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

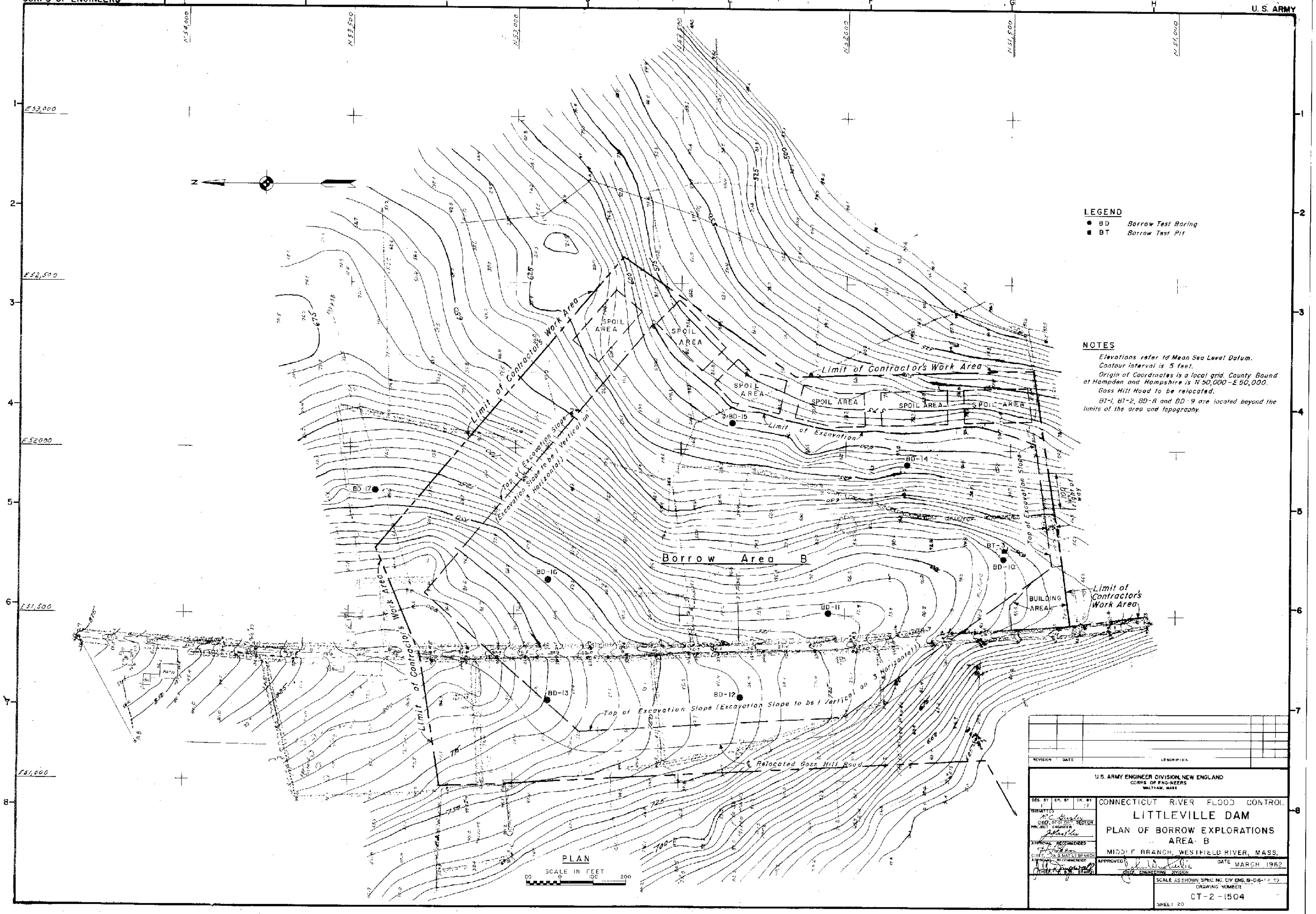
SCALE AS SHOWN

SPEC. NO. [illegible]

DRAWING NUMBER

CT-2-1505

SHEET 21



LEGEND

- ● BD *Borrow Test Boring*
- ■ BT *Borrow Test Pit*

NOTES

Elevations refer to Mean Sea Level Datum.

Contour interval is 5 feet.

Origin of Coordinates is a local grid. County Bound at Hampden and Hampshire is N 50,000 – E 50,000.

Goss Hill Road to be relocated.

BT-1, BT-2, BD-8 and BD-9 are located beyond the limits of the area and topography.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

PLAN OF BORROW EXPLORATIONS AREA B

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

DES. BY	DR. BY	CK. BY

SUBMITTED
R. C. Quigley
CHIEF, GEOLOGY SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, F.D. & MAT'LS BRANCH

APPROVAL RECOMMENDED
CHIEF, D. & S. BRANCH

APPROVED
CHIEF, ENGINEERING DIVISION

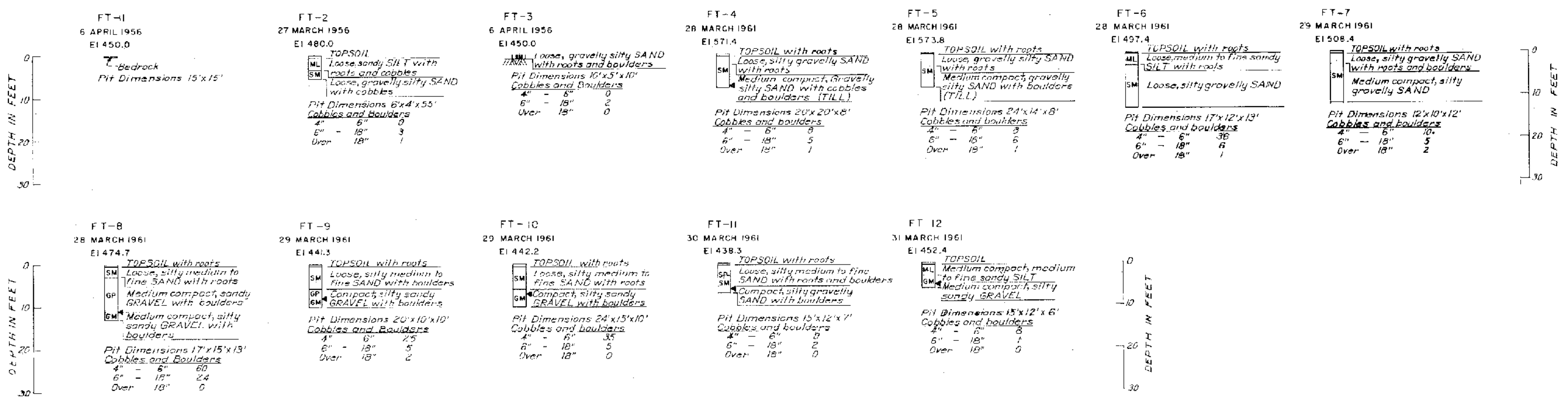
DATE MARCH 1962

SCALE AS SHOWN SPEC. NO. CIV ENG. 19-016-

DRAWING NUMBER
CT-2-1504

SHEET 20

CORPS OF ENGINEERS U. S. ARMY



FT-1
6 APRIL 1956
El 450.0
Bedrock
Pit Dimensions 15'x15'

FT-2
27 MARCH 1956
El 480.0
TOPSOIL
Loose, sandy SILT with roots and cobbles
Loose, gravelly silty SAND with cobbles
Pit Dimensions 6'x4'x5.5'

Cobbles and Boulders		
4"	6"	0
6" -	18"	3
Over	18"	1

FT-3
6 APRIL 1956
El 450.0
Loose, gravelly silty SAND with roots and boulders
Pit Dimensions 10'x5'x10'

Cobbles and Boulders		
4" -	6"	0
6" -	18"	2
Over	18"	0

FT-4
28 MARCH 1961
El 571.4
TOPSOIL with roots
Loose, silty gravelly SAND with roots
Medium compact, Gravelly silty SAND with cobbles and boulders (TILL)
Pit Dimensions 20'x20'x8'

Cobbles and boulders		
4" -	6"	8
6" -	18"	5
Over	18"	1

FT-5
28 MARCH 1961
El 573.8
TOPSOIL with roots
Loose, gravelly silty SAND with roots
Medium compact, gravelly silty SAND with boulders (TILL)
Pit Dimensions 24'x14'x8'

Cobbles and boulders		
4" -	6"	3
6" -	16"	6
Over	18"	1

FT-6
28 MARCH 1961
El 497.4
TOPSOIL with roots
Loose, medium to fine sandy SILT with roots
Loose, silty gravelly SAND
Pit Dimensions 17'x12'x13'

Cobbles and boulders		
4" -	6"	36
6" -	18"	6
Over	18"	1

FT-7
29 MARCH 1961
El 508.4
TOPSOIL with roots
Loose, silty gravelly SAND with roots and boulders
Medium compact, silty gravelly SAND
Pit Dimensions 12'x10'x12'

Cobbles and boulders		
4" -	6"	10
6" -	18"	5
Over	18"	2

FT-8
28 MARCH 1961
El 474.7
TOPSOIL with roots
Loose, silty medium to fine SAND with roots
Medium compact, sandy GRAVEL with boulders
Medium compact, silty sandy GRAVEL with boulders
Pit Dimensions 17'x15'x13'

Cobbles and Boulders		
4" -	6"	60
6" -	18"	24
Over	18"	0

FT-9
29 MARCH 1961
El 441.3
TOPSOIL with roots
Loose, silty medium to fine SAND with boulders
Compact, silty sandy GRAVEL with boulders
Pit Dimensions 20'x10'x10'

Cobbles and Boulders		
4"	6"	25
6" -	18"	5
Over	18"	2

FT-10
29 MARCH 1961
El 442.2
TOPSOIL with roots
Loose, silty medium to fine SAND with roots
Compact, silty sandy GRAVEL with boulders
Pit Dimensions 24'x15'x10'

Cobbles and boulders		
4" -	6"	35
6" -	18"	5
Over	18"	0

FT-11
30 MARCH 1961
El 438.3
TOPSOIL with roots
Loose, silty medium to fine SAND with roots and boulders
Compact, silty gravelly SAND with boulders
Pit Dimensions 15'x12'x7'

Cobbles and boulders		
4" -	6"	5
6" -	18"	2
Over	18"	0

FT 12
31 MARCH 1961
El 452.4
TOPSOIL
Medium compact, medium to fine sandy SILT
Medium compact, silty sandy GRAVEL
Pit Dimensions 15'x12'x6'

Cobbles and boulders		
4" -	6"	8
6" -	18"	1
Over	18"	0

NOTES
Elevations refer to Mean Sea Level Datum
For Location of Foundation Explorations, see Sheet No. 8
For Legend of Graphic Logs and applicable notes see Sheet No 14

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H.A.V.	R.D.B.	H.A.V.

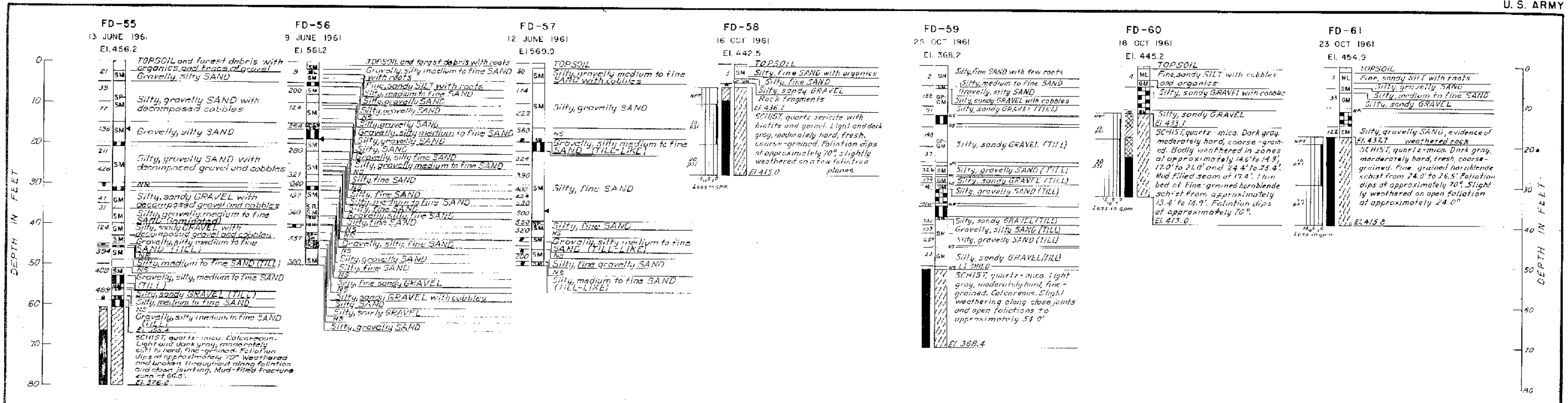
SUBMITTED
H. C. Eberley
HEAD, GEOLOGY SECTION
PROJECT ENGINEER
J. Hartley
APPROVAL RECOMMENDED
CHIEF, FDN & MAT'LS BRANCH
APPROVAL RECOMMENDED
J. C. Dingwall
CHIEF, PLANN. & REP'TS BRANCH

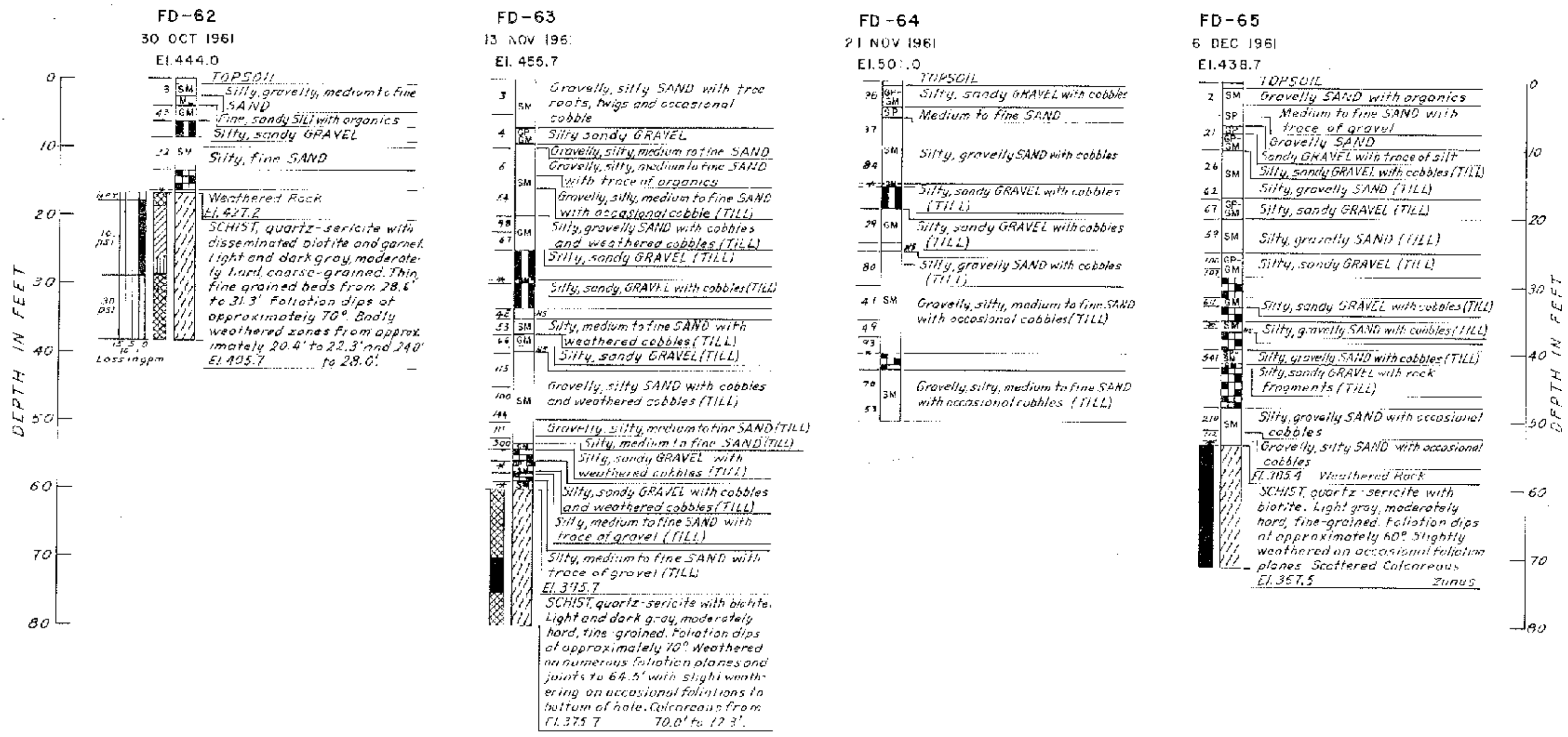
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
RECORD OF FOUNDATION EXPLORATIONS
NO. 6
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962
SCALE AS SHOWN
DRAWING NUMBER
CT-2-1503
SHEET 19

CORPS OF ENGINEERS

U. S. ARMY


FD-55
13 JUNE 1961
El. 456.2
TOPSOIL and forest debris with organics and trace of gravel
Gravelly, silty SAND
Silty, gravelly SAND with decomposed cobbles
Gravelly, silty SAND
Silty, gravelly SAND with decomposed gravel and cobbles
NR
Silty, sandy GRAVEL with decomposed gravel and cobbles
Silty, gravelly medium to fine SAND (laminated)
Silty, sandy GRAVEL with decomposed gravel and cobbles
Gravelly, silty medium to fine SAND (TILL)
NR
Silty, medium to fine SAND (TILL)
NS
Gravelly, silty, medium to fine SAND (TILL)
Silty, sandy GRAVEL (TILL)
Silty, medium to fine SAND
NS
Gravelly, silty medium to fine SAND (TILL)
El. 355.4
SCHIST, quartz-mica. Calcareous. Light and dark gray, moderately soft to hard, fine-grained. Foliation dips at approximately 70° Weathered and broken throughout along foliation and close jointing. Mud-filled fracture zone at 66.5'.
El. 376.2
FD-56
9 JUNE 1961
El. 561.2
TOPSOIL and forest debris with roots
Gravelly, silty medium to fine SAND with roots
Fine, sandy SILT with roots
Silty, medium to fine SAND
Silty, gravelly SAND
Silty, gravelly SAND
NS
Silty, gravelly SAND
Gravelly, silty medium to fine SAND
Silty, gravelly SAND
Silty, SAND
Gravelly, silty fine SAND
Silty, gravelly medium to fine SAND
NS
Silty, fine SAND
NS
Silty, fine SAND
Silty, medium to fine SAND
Silty, fine SAND
Gravelly, silty fine SAND
Silty, fine SAND
NS
NR
Gravelly, silty, fine SAND
NS
Silty, gravelly SAND
Silty, fine SAND
NS
Silty, fine sandy GRAVEL
NS
Silty, sandy GRAVEL with cobbles
Silty SAND
Silty, sandy GRAVEL
NS
Silty, gravelly SAND
FD-57
12 JUNE 1961
El. 569.0
TOPSOIL
Silty, gravelly medium to fine SAND with cobbles
Silty, gravelly SAND
NS
Gravelly, silty medium to fine SAND (TILL-LIKE)
Silty, fine SAND
Silty, fine SAND
NS
Gravelly, silty medium to fine SAND (TILL-LIKE)
NS
Silty, fine gravelly SAND
NS
Silty, medium to fine SAND (TILL-LIKE)
FD-58
16 OCT 1961
El. 442.5
TOPSOIL
Silty, fine SAND with organics
Silty, fine SAND
Silty, sandy GRAVEL
Rock fragments
El. 436.7
SCHIST, quartz sericite with biotite and garnet. Light and dark gray, moderately hard, fresh, coarse-grained. Foliation dips at approximately 70°, slightly weathered on a few foliation planes
El. 415.0
NPT
10 psi
20 psi
Loss in gpm
FD-59
25 OCT 1961
El. 368.2
Silty, fine SAND with few roots
Silty, medium to fine SAND
Gravelly, silty SAND
Silty, sandy GRAVEL with cobbles
Silty, sandy GRAVEL (TILL)
NS
NS
Silty, sandy GRAVEL (TILL)
NS
Silty, gravelly SAND (TILL)
Silty, sandy GRAVEL (TILL)
Silty, gravelly SAND (TILL)
NR
Silty, sandy GRAVEL (TILL)
Gravelly, silty SAND (TILL)
Silty, gravelly SAND (TILL)
NS
Silty, sandy GRAVEL (TILL)
NS El. 318.0
SCHIST, quartz-mica. Light gray, moderately hard, fine-grained. Calcareous. Slight weathering along close joints and open foliations to approximately 54.0'
El. 368.4
FD-60
18 OCT 1961
El. 445.2
TOPSOIL
Fine, sandy SILT with cobbles and organics
Silty, sandy GRAVEL with cobbles
Silty, sandy GRAVEL
El. 433.1
SCHIST, quartz-mica. Dark gray, moderately hard, coarse-grained. Badly weathered in zones at approximately 14.0' to 14.9', 17.0' to 21.0' and 24.4' to 25.4'. Mud filled seam at 17.4'. Thin bed of fine-grained hornblende schist from approximately 13.4' to 14.9'. Foliation dips at approximately 70°.
El. 413.0
NPT
10 psi
20 psi
Loss in gpm
FD-61
23 OCT 1961
El. 454.9
TOPSOIL
Fine, sandy SILT with roots
Silty, gravelly SAND
Silty, medium to fine SAND
Silty, sandy GRAVEL
NR
Silty, gravelly SAND, evidence of weathered rock
El. 437.7
SCHIST, quartz-mica. Dark gray, moderately hard, fresh, coarse-grained. Fine grained hornblende schist from 24.0' to 26.5'. Foliation dips at approximately 70°. Slightly weathered on open foliation at approximately 24.0'
El. 415.8
NPT
10 psi
20 psi
Loss in gpm
ML
SM
SP-SM
GM
GP-GM
DEPTH IN FEET
0
10
20
30
40
50
60
70
80


FD-62
30 OCT 1961
El. 444.0
TOPSOIL
Silty, gravelly, medium to fine SAND
Fine, sandy SILT with organics
Silty, sandy GRAVEL
Silty, fine SAND
Weathered Rock
El. 427.2
SCHIST, quartz-sericite with disseminated biotite and garnet. Light and dark gray, moderately hard, coarse-grained. Thin, fine grained beds from 28.6' to 31.3'. Foliation dips at approximately 70°. Badly weathered zones from approximately 20.4' to 22.3' and 24.0' to 28.0'.
El. 405.7
NPT
10 psi
30 psi
Loss in gpm
FD-63
13 NOV 1961
El. 455.7
Gravelly, silty SAND with tree roots, twigs and occasional cobble
Silty sandy GRAVEL
Gravelly, silty, medium to fine SAND
Gravelly, silty, medium to fine SAND with trace of organics
Gravelly, silty, medium to fine SAND with occasional cobble (TILL)
Silty, gravelly SAND with cobbles and weathered cobbles (TILL)
Silty, sandy GRAVEL (TILL)
Silty, sandy, GRAVEL with cobbles (TILL)
NS
Silty, medium to fine SAND with weathered cobbles (TILL)
Silty, sandy GRAVEL (TILL)
Gravelly, silty SAND with cobbles and weathered cobbles (TILL)
Gravelly, silty medium to fine SAND (TILL)
Silty, medium to fine SAND (TILL)
Silty, sandy GRAVEL with weathered cobbles (TILL)
Silty, sandy GRAVEL with cobbles and weathered cobbles (TILL)
Silty, medium to fine SAND with trace of gravel (TILL)
Silty, medium to fine SAND with trace of gravel (TILL)
El. 395.7
SCHIST, quartz-sericite with biotite. Light and dark gray, moderately hard, fine grained. Foliation dips of approximately 70°. Weathered on numerous foliation planes and joints to 64.5' with slight weathering on occasional foliations to bottom of hole. Calcareous from 70.0' to 72.3'.
El. 375.7
FD-64
21 NOV 1961
El. 501.0
TOPSOIL
Silty, sandy GRAVEL with cobbles
Medium to fine SAND
Silty, gravelly SAND with cobbles
Silty, sandy GRAVEL with cobbles (TILL)
Silty, sandy GRAVEL with cobbles (TILL)
Silty, gravelly SAND with cobbles (TILL)
Gravelly, silty, medium to fine SAND with occasional cobbles (TILL)
Gravelly, silty, medium to fine SAND with occasional cobbles (TILL)
FD-65
6 DEC 1961
El. 438.7
TOPSOIL
Gravelly SAND with organics
Medium to fine SAND with trace of gravel
Gravelly SAND
Sandy GRAVEL with trace of silt
Silty, sandy GRAVEL with cobbles (TILL)
Silty, gravelly SAND (TILL)
Silty, sandy GRAVEL (TILL)
Silty, gravelly SAND (TILL)
Silty, sandy GRAVEL (TILL)
Silty, sandy GRAVEL with cobbles (TILL)
Silty, gravelly SAND with cobbles (TILL)
Silty, gravelly SAND with cobbles (TILL)
Silty, sandy GRAVEL with rock fragments (TILL)
Silty, gravelly SAND with occasional cobbles
Gravelly, silty SAND with occasional cobbles
El. 385.4 Weathered Rock
SCHIST, quartz-sericite with biotite. Light gray, moderately hard, fine-grained. Foliation dips at approximately 60°. Slightly weathered on occasional foliation planes. Scattered Calcareous Zones
El. 357.5
DEPTH IN FEET
0
10
20
30
40
50
60
70
80

NOTES

Elevations refer to Mean Sea Level Datum

For Location of Foundation Explorations, see Sheet No 8

For Legend of Graphic Logs and applicable notes, see Sheet No. 14

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY H.A.V. | DR. BY R.D.B. | CK. BY H.A.V.

SUBMITTED H. C. Chesley
HEAD, GEOLOGY SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, FDN & MAT'LS BRANCH

APPROVAL RECOMMENDED
CHIEF, PLANN. & R.P.'S BRANCH

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

RECORD OF FOUNDATION EXPLORATIONS
NO. 5

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

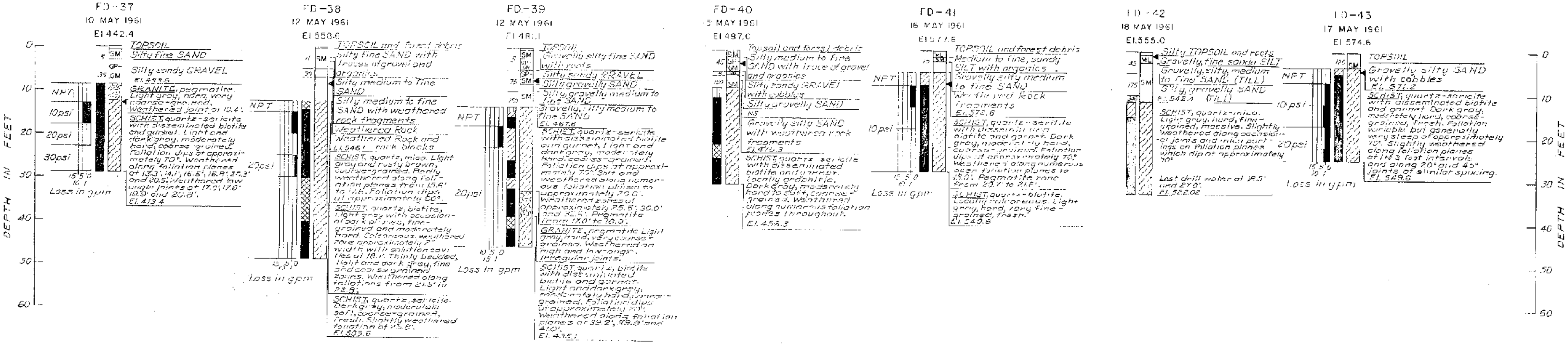
APPROVED
CHIEF, ENGINEERING DIVISION

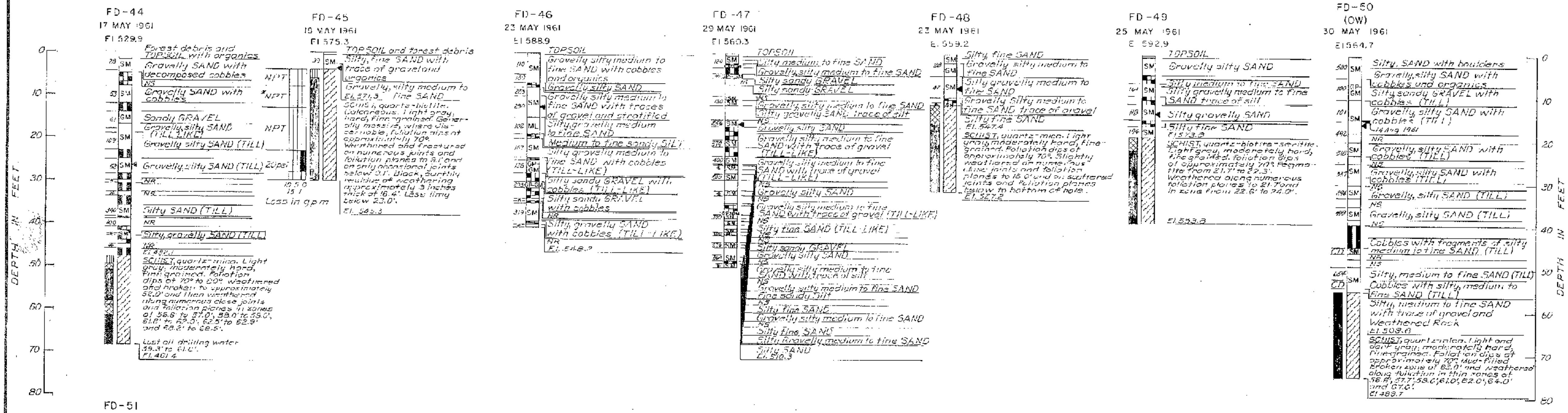
DATE MARCH 1962

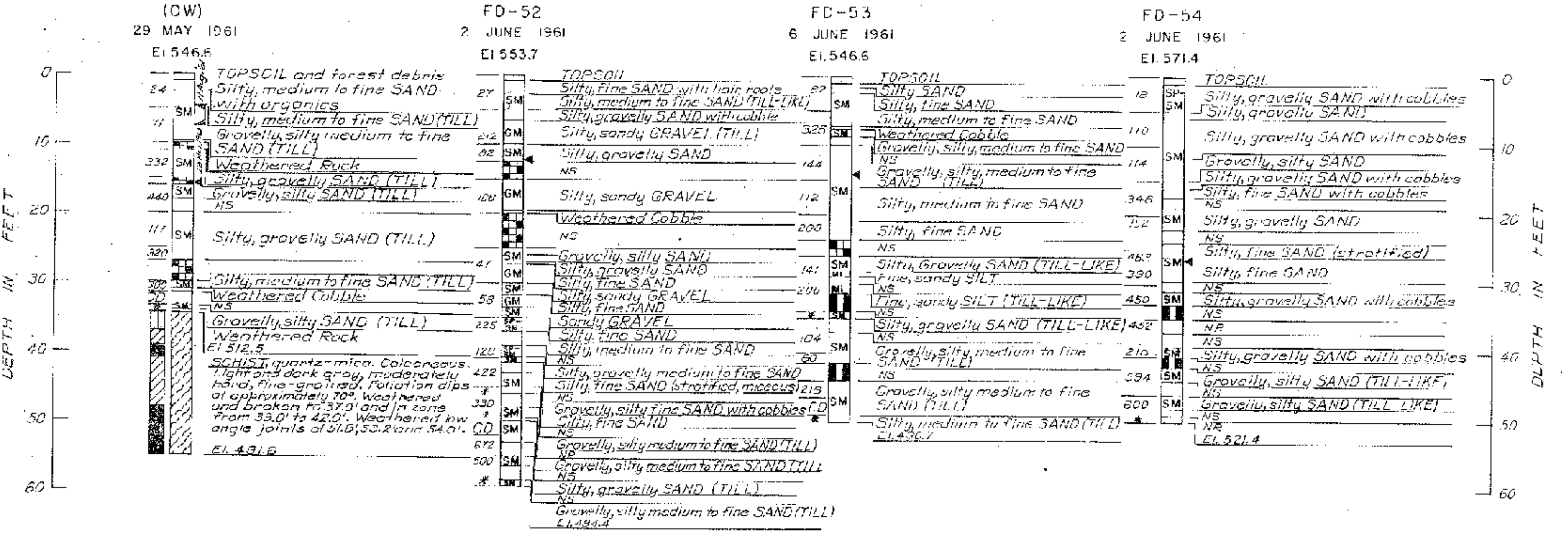
SCALE AS SHOWN | SPEC. NO. CIV ENG-19-016-62-49

DRAWING NUMBER
CT-2-1502

SHEET 10


FD-37
10 MAY 1961
El 442.4
TOPSOIL
Silty fine SAND
Silty sandy GRAVEL
El 433.6
GRANITE, pegmatite. Light gray, hard, very coarse-grained. Weathered joint at 10.4'.
SCHIST, quartz-sericite with disseminated biotite and garnet. Light and dark gray, moderately hard, coarse-grained. Foliation dips at approximately 70°. Weathered along foliation planes at 13.3', 14.1', 16.5', 18.8', 25.3' and 20.5'. Weathered low angle joints at 17.0', 17.6', 19.9' and 20.8'.
El 413.4
NPT
10psi
20psi
30psi
15 5 0
10 1
Loss in gpm
FD-38
12 MAY 1961
El 550.6
TOPSOIL and forest debris
Silty fine SAND with traces of gravel and organics
Silty medium to fine SAND
Silty medium to fine SAND with weathered rock fragments
Weathered Rock
Weathered Rock and rock blocks
El 546.1
SCHIST, quartz, mica. Light gray and rusty brown, coarse-grained. Badly weathered along foliation planes from 15.6' to 17.6'. Foliation dips at approximately 60°.
SCHIST, quartz, biotite, light gray with occasional dark phases, fine-grained and moderately hard. Calcareous, weathered zone approximately 2" width with solution cavities at 18.1'. Thinly bedded, light and dark grey, fine and coarse grained zones. Weathered along foliations from 21.5' to 22.8'.
SCHIST, quartz, sericite. Dark grey, moderately soft, coarse-grained, fresh. Slightly weathered foliation at 45.8'.
El 505.6
NPT
20psi
15 5 0
Loss in gpm
FD-39
12 MAY 1961
El 481.1
TOPSOIL
Gravelly silty fine SAND with roots
Silty sandy GRAVEL
Silty gravelly SAND
Silty, gravelly medium to fine SAND
Gravelly, silty medium to fine SAND
El 467.6
SCHIST, quartz-sericite with disseminated biotite and garnet, light and dark gray, moderately hard, coarse-grained. Foliation dips at approximately 70°. Soft and weathered along numerous foliation planes to approximately 20.0'. Weathered zones at approximately 25.5', 30.0' and 32.5'. Pegmatite from 17.0' to 18.0'.
GRANITE, pegmatite. Light gray, hard, very coarse-grained. Weathered on high and low-angle irregular joints.
SCHIST, quartz, biotite with disseminated biotite and garnet. Light and dark grey, moderately hard, coarse-grained. Foliation dips at approximately 70°. Weathered along foliation planes at 39.2', 39.8' and 41.0'.
El 435.1
NPT
20psi
10 5 0
15 1
Loss in gpm
FD-40
15 MAY 1961
El 497.0
Topsoil and forest debris
Silty medium to fine SAND with trace of gravel and organics
Silty sandy GRAVEL with cobbles
Silty gravelly SAND
NS
Gravelly silty SAND with weathered rock fragments
El 476.3
SCHIST, quartz sericite with disseminated biotite and garnet. Locally graphitic. Dark gray, moderately hard to soft, coarse-grained. Weathered along numerous foliation planes throughout.
El 456.3
FD-41
16 MAY 1961
El 577.6
TOPSOIL and forest debris
Medium to fine, sandy SILT with organics
Gravelly silty medium to fine SAND
Weathered Rock fragments
El 572.6
SCHIST, quartz-sericite with disseminated biotite and garnet. Dark gray, moderately hard, coarse-grained. Foliation dips at approximately 70°. Weathered along numerous open foliation planes to 13.0'. Pegmatite zone from 20.1' to 21.6'.
SCHIST, quartz-biotite. Locally calcareous. Light gray, hard, very fine-grained, fresh.
El 540.6
NPT
10psi
15 5 0
10 1
Loss in gpm
FD-42
18 MAY 1961
El 555.0
Silty TOPSOIL and roots
Gravelly, fine sandy SILT
Gravelly, silty, medium to fine SAND (TILL)
Silty, gravelly SAND (TILL)
El 542.4
SCHIST, quartz-mica. Light gray, hard, fine-grained, massive. Slightly weathered along occasional joints and mica partings on foliation planes which dip at approximately 70°.
Lost drill water at 18.5' and 27.0'.
El 522.02
NPT
10psi
20psi
15 5 0
10 1
Loss in gpm
FD-43
17 MAY 1961
El 574.6
TOPSOIL
Gravelly silty SAND with cobbles
El 571.2
SCHIST, quartz-sericite with disseminated biotite and garnet. Dark gray, moderately hard, coarse-grained, fresh. Foliation variable but generally very steep at approximately 70°. Slightly weathered along foliation planes at 1 to 3 foot intervals and along 20° and 45° joints of similar spacing.
El 549.6
DEPTH IN FEET
0
10
20
30
40
50
60
ML
SM
GP-GM
NR
NS


FD-44
17 MAY 1961
El 529.9
Forest debris and TOPSOIL with organics
Gravelly SAND with decomposed cobbles
NS
Gravelly SAND with cobbles
Sandy GRAVEL
Gravelly silty SAND (TILL-LIKE)
Gravelly silty SAND (TILL)
Gravelly silty SAND (TILL)
NR
NR
Silty SAND (TILL)
NR
Silty, gravelly SAND (TILL)
NR
El 482.1
SCHIST, quartz-mica. Light gray, moderately hard, fine grained. Foliation dips of 70° to 80°. Weathered and broken to approximately 52.0' and then weathered along numerous close joints and foliation planes in zones of 56.6' to 57.0', 58.0' to 59.0', 61.8' to 62.0', 62.5' to 62.9' and 68.2' to 68.5'.
Lost all drilling water 39.3' to 61.0'.
El 461.4
NPT
NPT
NPT
20psi
FD-45
15 MAY 1961
El 575.3
TOPSOIL and forest debris
Silty, fine SAND with trace of gravel and organics
Gravelly, silty medium to fine SAND
El 571.3
SCHIST, quartz-biotite. Calcareous. Light gray, hard, fine-grained. Generally massive, where discernible, foliation dips at approximately 70°. Weathered and fractured on numerous joints and foliation planes to 9.1' and on only occasional joints below 9.1'. Black, earthy residue of weathering approximately 3 inches thick at 16.4'. Less limy below 23.0'.
El 545.3
10 5 0
15 1
Loss in gpm
FD-46
23 MAY 1961
El 588.9
TOPSOIL
Gravelly silty medium to fine SAND with cobbles and organics
Gravelly silty SAND
Gravelly silty medium to fine SAND with traces of gravel and stratified
Silty gravelly medium to fine SAND
Medium to fine sandy SILT
Silty gravelly medium to fine SAND with cobbles (TILL-LIKE)
Silty sandy GRAVEL with cobbles (TILL-LIKE)
Silty sandy GRAVEL with cobbles
NR
Silty gravelly SAND with cobbles (TILL-LIKE)
NR
El 548.2
FD-47
29 MAY 1961
El 560.3
TOPSOIL
Silty medium to fine SAND
Gravelly silty medium to fine SAND
Silty sandy GRAVEL
Silty sandy GRAVEL
NS
Gravelly silty medium to fine SAND
Silty gravelly SAND trace of silt
NS
Gravelly silty SAND
Gravelly silty medium to fine SAND with trace of gravel (TILL-LIKE)
Gravelly silty medium to fine SAND with trace of gravel (TILL-LIKE)
NS
Gravelly silty SAND
NS
Gravelly silty medium to fine SAND with trace of gravel (TILL-LIKE)
NS
Silty fine SAND (TILL-LIKE)
NS
Silty sandy GRAVEL
Gravelly silty SAND
NS
Gravelly silty medium to fine SAND with trace of silt
NS
Gravelly silty medium to fine SAND
Fine sandy Silt
NS
Silty fine SAND
Gravelly silty medium to fine SAND
NS
Silty fine SAND
Silty Gravelly medium to fine SAND
Silty SAND
El 510.3
FD-48
23 MAY 1961
El 559.2
Silty fine SAND
Gravelly silty medium to fine SAND
Silty gravelly medium to fine SAND
Gravelly Silty medium to fine SAND trace of gravel
Silty fine SAND
El 547.4
SCHIST, quartz-mica. Light gray, moderately hard, fine-grained. Foliation dips of approximately 70°. Slightly weathered on numerous close joints and foliation planes to 16.0' and on scattered joints and foliation planes below to bottom of hole.
El 527.2
FD-49
25 MAY 1961
El 592.9
TOPSOIL
Gravelly silty SAND
Silty medium to fine SAND
Silty gravelly medium to fine SAND trace of silt
Silty gravelly SAND
Silty fine SAND
El 573.3
SCHIST, quartz-biotite-sericite. Light gray, moderately hard, fine grained. Foliation dips of approximately 70°. Pegmatite from 21.7' to 22.3'. Weathered along numerous foliation planes to 21.7' and in zone from 22.6' to 24.0'.
El 553.3
FD-50
(OW)
30 MAY 1961
El 564.7
Silty, SAND with boulders
Gravelly, silty SAND with cobbles and organics
Silty sandy GRAVEL with cobbles (TILL)
Gravelly, silty SAND with cobbles (TILL)
14 Aug 1961
NR
Gravelly, silty SAND with cobbles (TILL)
NS
Gravelly, silty SAND with cobbles (TILL)
NS
Gravelly, silty SAND (TILL)
NS
Gravelly, silty SAND (TILL)
NS
Cobbles with fragments of silty medium to fine SAND (TILL)
NR
NS
Silty, medium to fine SAND (TILL)
Cobbles with silty, medium to fine SAND (TILL)
Silty, medium to fine SAND with trace of gravel and Weathered Rock
El 509.6
SCHIST, quartz-mica. Light and dark gray, moderately hard, fine-grained. Foliation dips at approximately 70°. Mud-filled broken zone at 63.0' and weathered along foliation in thin zones at 56.8', 57.7', 59.0', 61.0', 62.0', 64.0' and 67.0'.
El 489.7
CD
DEPTH IN FEET
0
10
20
30
40
50
60
70
80


FD-51
(OW)
29 MAY 1961
El 546.6
TOPSOIL and forest debris
Silty, medium to fine SAND with organics
Silty, medium to fine SAND (TILL)
Gravelly, silty medium to fine SAND (TILL)
Weathered Rock
Silty, gravelly SAND (TILL)
Gravelly, silty SAND (TILL)
NS
Silty, gravelly SAND (TILL)
Silty, medium to fine SAND (TILL)
Weathered Cobble
NS
Gravelly, silty SAND (TILL)
Weathered Rock
El 512.5
SCHIST, quartz-mica. Calcareous. Light and dark gray, moderately hard, fine-grained. Foliation dips of approximately 70°. Weathered and broken to 37.9' and in zone from 39.0' to 42.0'. Weathered low angle joints at 51.6', 53.2' and 54.0'.
El 491.6
FD-52
2 JUNE 1961
El 553.7
TOPSOIL
Silty, fine SAND with hair roots
Silty, medium to fine SAND (TILL-LIKE)
Silty, gravelly SAND with cobble
Silty, sandy GRAVEL (TILL)
Silty, gravelly SAND
NS
Silty, sandy GRAVEL
Weathered Cobble
NS
Gravelly, silty SAND
Silty, gravelly SAND
Silty, fine SAND
Silty, sandy GRAVEL
Silty, fine SAND
Sandy GRAVEL
Silty, fine SAND
Silty, medium to fine SAND
NS
Silty, gravelly medium to fine SAND
Silty, fine SAND (stratified, micaceous)
NS
Gravelly, silty fine SAND with cobbles
Silty, fine SAND
NS
Gravelly, silty medium to fine SAND (TILL)
NS
Gravelly, silty medium to fine SAND (TILL)
NS
Silty, gravelly SAND (TILL)
NS
Gravelly, silty medium to fine SAND (TILL)
El 484.4
FD-53
6 JUNE 1961
El 546.6
TOPSOIL
Silty SAND
Silty, fine SAND
Silty, medium to fine SAND
Weathered Cobble
Gravelly, silty, medium to fine SAND
NS
Gravelly, silty, medium to fine SAND (TILL)
Silty, medium to fine SAND
Silty, fine SAND
NS
Silty, Gravelly SAND (TILL-LIKE)
Fine, sandy SILT
NS
Fine, sandy SILT (TILL-LIKE)
NS
Silty, gravelly SAND (TILL-LIKE)
NS
Gravelly, silty, medium to fine SAND (TILL)
NS
Gravelly, silty medium to fine SAND (TILL)
Silty, medium to fine SAND (TILL)
El 496.7
FD-54
2 JUNE 1961
El 571.4
TOPSOIL
Silty, gravelly SAND with cobbles
Silty, gravelly SAND
Silty, gravelly SAND with cobbles
Gravelly, silty SAND
Silty, gravelly SAND with cobbles
Silty, fine SAND with cobbles
NS
Silty, gravelly SAND
NS
Silty, fine SAND (stratified)
Silty, fine SAND
NS
Silty, gravelly SAND with cobbles
NS
NR
NS
Silty, gravelly SAND with cobbles
NS
Gravelly, silty SAND (TILL-LIKE)
NS
Gravelly, silty SAND (TILL-LIKE)
NS
NR
El 521.4
DEPTH IN FEET
0
10
20
30
40
50
60

NOTES

Elevations refer to Mean Sea Level Datum.
For Location of Foundation Explorations, see Sheet No. 8
For Legend of Graphic Logs and applicable notes, see Sheet No. 14

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.A.V. | DR. BY R.D.B. | CK. BY H.A.V.

SUBMITTED
HEAD, GEOLOGY SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, FDN & MAT'LS BRANCH

APPROVAL RECOMMENDED
J. C. Dingwell
CHIEF, PLAN'G & REP'TS BRANCH

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

RECORD OF FOUNDATION EXPLORATIONS
NO. 4

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

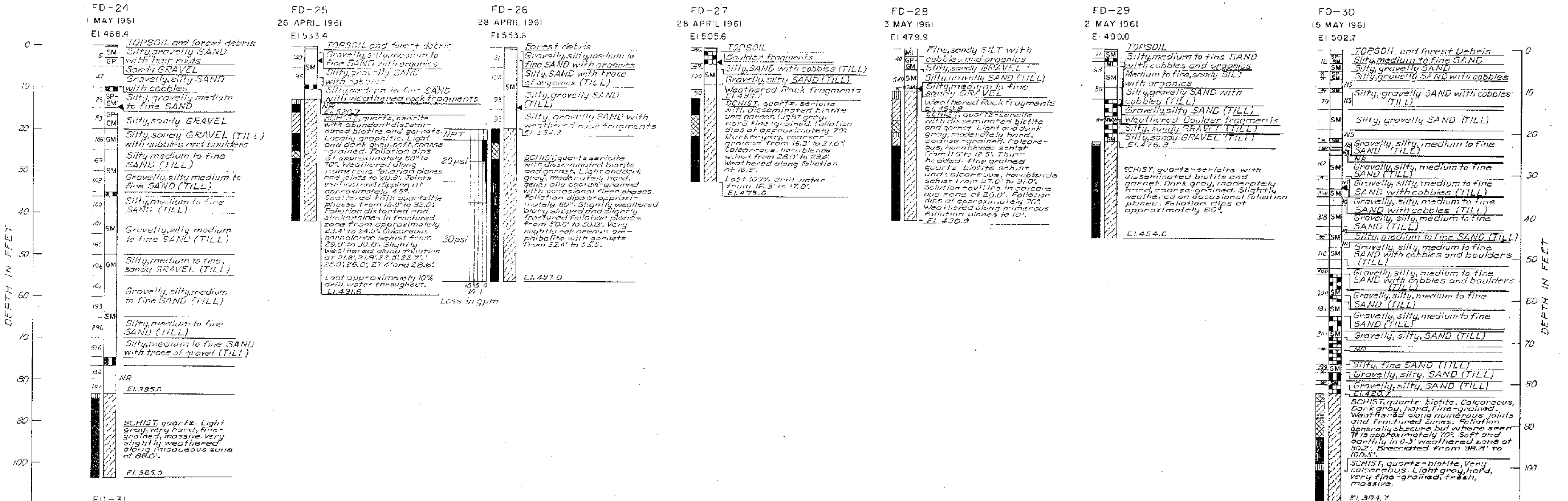
SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49

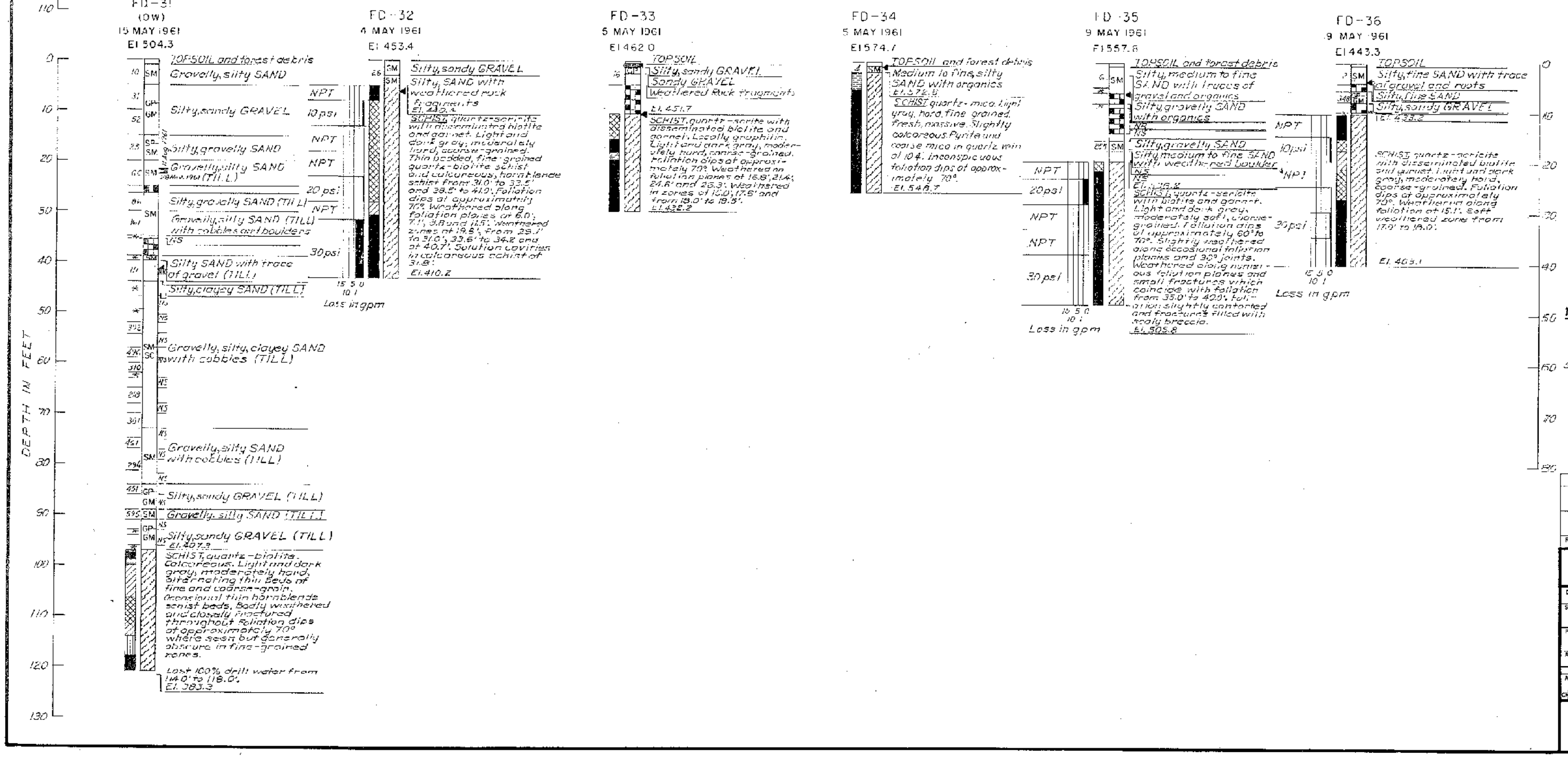
DRAWING NUMBER
CT-2-1501

SHEET 17

CORPS OF ENGINEERS

U. S. ARMY


DEPTH IN FEET
0
10
20
30
40
50
60
70
80
90
100
110
FD-24
1 MAY 1961
El 466.4
TOPSOIL and forest debris
Silty, gravelly SAND with hair roots
Sandy GRAVEL
Gravelly, silty SAND with cobbles
Silty, gravelly medium to fine SAND
Silty, sandy GRAVEL
Silty, sandy GRAVEL (TILL) with cobbles and boulders
Silty medium to fine SAND (TILL)
Gravelly, silty medium to fine SAND (TILL)
Silty, medium to fine SAND (TILL)
Gravelly, silty medium to fine SAND (TILL)
Silty, medium to fine, sandy GRAVEL (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Silty, medium to fine SAND (TILL)
Silty, medium to fine SAND with trace of gravel (TILL)
NR
El. 385.0
SCHIST, quartz. Light gray, very hard, fine-grained, massive. Very slightly weathered along micaceous zone at 88.0'.
El. 365.3
SM
GP
SP-SM
GP-GM
GM
FD-25
26 APRIL 1961
El 553.4
TOPSOIL and forest debris
Gravelly, silty, medium to fine SAND with organics
Silty, gravelly SAND with cobbles
Silty medium to fine SAND with weathered rock fragments
NR
El. 520.7
SCHIST, quartz, sericite with abundant disseminated biotite and garnets. Locally graphitic. Light and dark gray, soft, coarse-grained. Foliation dips at approximately 60° to 70°. Weathered along numerous foliation planes and joints to 20.9'. Joints vertical and dipping at approximately 45°. Scattered thin quartzitic phases from 18.0' to 32.0'. Foliation distorted and slickensides in fractured zone from approximately 23.4' to 24.0'. Calcareous hornblende schist from 29.0' to 30.8'. Slightly weathered along foliation at 21.8', 21.9', 22.0', 22.7', 25.0', 26.0', 27.4' and 28.6'.
Lost approximately 10% drill water throughout.
El. 491.6
NPT
20 psi
30 psi
15 5 0
10 1
Loss in gpm
FD-26
28 APRIL 1961
El 553.6
Forest debris
Gravelly, silty, medium to fine SAND with organics
Silty, SAND with trace of organics (TILL)
Silty, gravelly SAND (TILL)
Silty, gravelly SAND with weathered rock fragments
El. 534.3
SCHIST, quartz sericite with disseminated biotite and garnet. Light and dark gray, moderately hard, generally coarse-grained with occasional finer phases. Foliation dips at approximately 60°. Slightly weathered along slipped and slightly fractured foliation planes from 50.0' to 50.8'. Very slightly calcareous amphibolite with garnets from 52.4' to 53.5'.
El. 497.0
FD-27
28 APRIL 1961
El 505.6
TOPSOIL
Boulder fragments
Silty, SAND with cobbles (TILL)
Gravelly, silty SAND (TILL)
Weathered Rock fragments
El. 493.7
SCHIST, quartz, sericite with disseminated biotite and garnet. Light gray, hard fine-grained. Foliation dips at approximately 70°. Darker gray, coarser-grained from 16.3' to 21.0'. Calcareous, hornblende schist from 28.0' to 29.4'. Weathered along foliation at 16.3'.
Lost 100% drill water from 16.3' to 17.0'.
El. 475.6
FD-28
3 MAY 1961
El 479.9
Fine, sandy SILT with cobbles and organics
Silty, sandy GRAVEL
Silty, gravelly SAND (TILL)
Silty, medium to fine, sandy GRAVEL
Weathered Rock fragments
El. 469.9
SCHIST, quartz-sericite with disseminated biotite and garnet. Light and dark gray, moderately hard, coarse-grained. Calcareous, hornblende schist from 11.0' to 12.5'. Thin-bedded, fine grained quartz biotite schist and calcareous, hornblende schist from 27.0' to 31.0'. Solution cavities in calcareous zone at 28.0'. Foliation dips at approximately 70°. Weathered along numerous foliation planes to 10'.
El. 430.9
ML
GP-GM
FD-29
2 MAY 1961
El 490.0
TOPSOIL
Silty, medium to fine SAND with cobbles and organics
Medium to fine, sandy SILT with organics
Silty, gravelly SAND with cobbles (TILL)
Gravelly, silty SAND (TILL)
Weathered Boulder fragments
Silty, sandy GRAVEL (TILL)
Silty, sandy GRAVEL (TILL)
El. 476.3
SCHIST, quartz-sericite with disseminated biotite and garnet. Dark gray, moderately hard, coarse-grained. Slightly weathered on occasional foliation planes. Foliation dips at approximately 60°.
El. 454.0
FD-30
15 MAY 1961
El 502.7
TOPSOIL and forest Debris
Silty, medium to fine SAND
Silty, gravelly SAND
Silty, gravelly SAND with cobbles
NS
Silty, gravelly SAND with cobbles (TILL)
Silty, gravelly SAND (TILL)
Gravelly, silty, medium to fine SAND (TILL)
NR
Gravelly, silty, medium to fine SAND (TILL)
Gravelly, silty, medium to fine SAND with cobbles (TILL)
Gravelly, silty, medium to fine SAND with cobbles (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Silty, medium to fine SAND (TILL)
Gravelly, silty, medium to fine SAND with cobbles and boulders (TILL)
Gravelly, silty, medium to fine SAND with cobbles and boulders (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Gravelly, silty, SAND (TILL)
NR
Silty, fine SAND (TILL)
Gravelly, silty, SAND (TILL)
Gravelly, silty, SAND (TILL)
El. 420.7
SCHIST, quartz-biotite. Calcareous, Dark gray, hard, fine-grained. Weathered along numerous joints and fractured zones. Foliation generally obscure but where seen it is approximately 70°. Soft and earthly in 0.3' weathered zone at 90.2'. Brecciated from 99.8' to 100.5'.
SCHIST, quartz-biotite, Very calcareous. Light gray, hard, very fine-grained, fresh, massive.
El. 394.7


DEPTH IN FEET
0
10
20
30
40
50
60
70
80
90
100
110
120
130
FD-31
(OW)
15 MAY 1961
El 504.3
TOPSOIL and forest debris
Gravelly, silty SAND
Silty, sandy GRAVEL
Silty, gravelly SAND
Gravelly, silty SAND (TILL)
Silty, gravelly SAND (TILL)
Gravelly, silty SAND (TILL) with cobbles and boulders
NS
Silty SAND with trace of gravel (TILL)
Silty, clayey SAND (TILL)
Gravelly, silty, clayey SAND with cobbles (TILL)
Gravelly, silty SAND with cobbles (TILL)
Silty, sandy GRAVEL (TILL)
Gravelly, silty SAND (TILL)
Silty, sandy GRAVEL (TILL)
El. 407.3
SCHIST, quartz-biotite. Calcareous. Light and dark gray, moderately hard, alternating thin beds of fine and coarse-grain. Occasional thin hornblende schist beds. Badly weathered and closely fractured throughout. Foliation dips at approximately 70° where seen but generally obscure in fine-grained zones.
Lost 100% drill water from 114.0' to 118.0'.
El. 383.3
NPT
10 psi
NPT
NPT
20 psi
NPT
30 psi
15 5 0
10 1
Loss in gpm
SM
GP-GM
SP-SM
SM-SC
FD-32
4 MAY 1961
El 453.4
Silty, sandy GRAVEL
Silty, SAND with weathered rock fragments
El. 443.4
SCHIST, quartz-sericite with disseminated biotite and garnet. Light and dark gray, moderately hard, coarse-grained. Thin bedded, fine-grained quartz-biotite schist and calcareous, hornblende schist from 31.0' to 33.5' and 38.5' to 41.0'. Foliation dips at approximately 70°. Weathered along foliation planes at 6.0', 7.1', 9.8' and 11.5'. Weathered zones at 19.8', from 29.7' to 31.0', 33.6' to 34.2' and at 40.7'. Solution cavities in calcareous schist at 31.8'.
El. 410.2
FD-33
5 MAY 1961
El 462.0
TOPSOIL
Silty, sandy GRAVEL
Sandy GRAVEL
Weathered Rock fragments
El. 451.7
SCHIST, quartz-sericite with disseminated biotite and garnet. Locally graphitic. Light and dark gray, moderately hard, coarse-grained. Foliation dips at approximately 70°. Weathered on foliation planes at 16.8', 21.4', 24.6' and 25.3'. Weathered in zones at 15.0', 17.5' and from 18.0' to 19.5'.
El. 432.2
FD-34
5 MAY 1961
El 574.7
TOPSOIL and forest debris
Medium to fine, silty SAND with organics
El. 572.8
SCHIST, quartz-mica. Light gray, hard, fine grained, fresh, massive. Slightly calcareous. Pyrite and coarse mica in quartz vein at 10.4'. Inconspicuous foliation dips of approximately 70°.
El. 548.7
NPT
20 psi
NPT
NPT
30 psi
15 5 0
10 1
Loss in gpm
FD-35
9 MAY 1961
El 557.8
TOPSOIL and forest debris
Silty, medium to fine SAND with traces of gravel and organics
Silty, gravelly SAND with organics
NS
NS
Silty, gravelly SAND
Silty, medium to fine SAND with weathered boulder
NS
NS
El. 535.8
SCHIST, quartz-sericite with biotite and garnet. Light and dark gray, moderately soft, coarse-grained. Foliation dips of approximately 60° to 70°. Slightly weathered along occasional foliation planes and 30° joints. Weathered along numerous foliation planes and small fractures which coincide with foliation from 35.0' to 40.0'. Foliation slightly contorted and fractures filled with scaly breccia.
El. 505.8
NPT
10 psi
NPT
30 psi
15 5 0
10 1
Loss in gpm
FD-36
9 MAY 1961
El 443.3
TOPSOIL
Silty, fine SAND with trace of gravel and roots
Silty, fine SAND
Silty, sandy GRAVEL
El. 433.2
SCHIST, quartz-sericite with disseminated biotite and garnet. Light and dark gray, moderately hard, coarse-grained. Foliation dips at approximately 70°. Weathered along foliation at 15.1'. Soft weathered zone from 17.0' to 18.0'.
El. 403.1
0
10
20
30
40

50 **NOTES**

Elevations refer to Mean Sea Level Datum.

For Location of Foundation Explorations, see Sheet No. 8

For Legend of Graphic Logs and applicable notes, see Sheet No. 14

60

70

80

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY H.A.V.	DR. BY R.D.B.	CK. BY H.A.V.

SUBMITTED H.C. Gurley
HEAD, GEOLOGY SECTION

PROJECT ENGINEER
J. Hartley

APPROVAL RECOMMENDED
CHIEF, FDN & MAT'LS BRANCH

APPROVAL RECOMMENDED J.C. Ringwald
CHIEF, PLANN. & R'PTS BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
RECORD OF FOUNDATION EXPLORATIONS
NO. 3
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED John Wm. Leslie
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

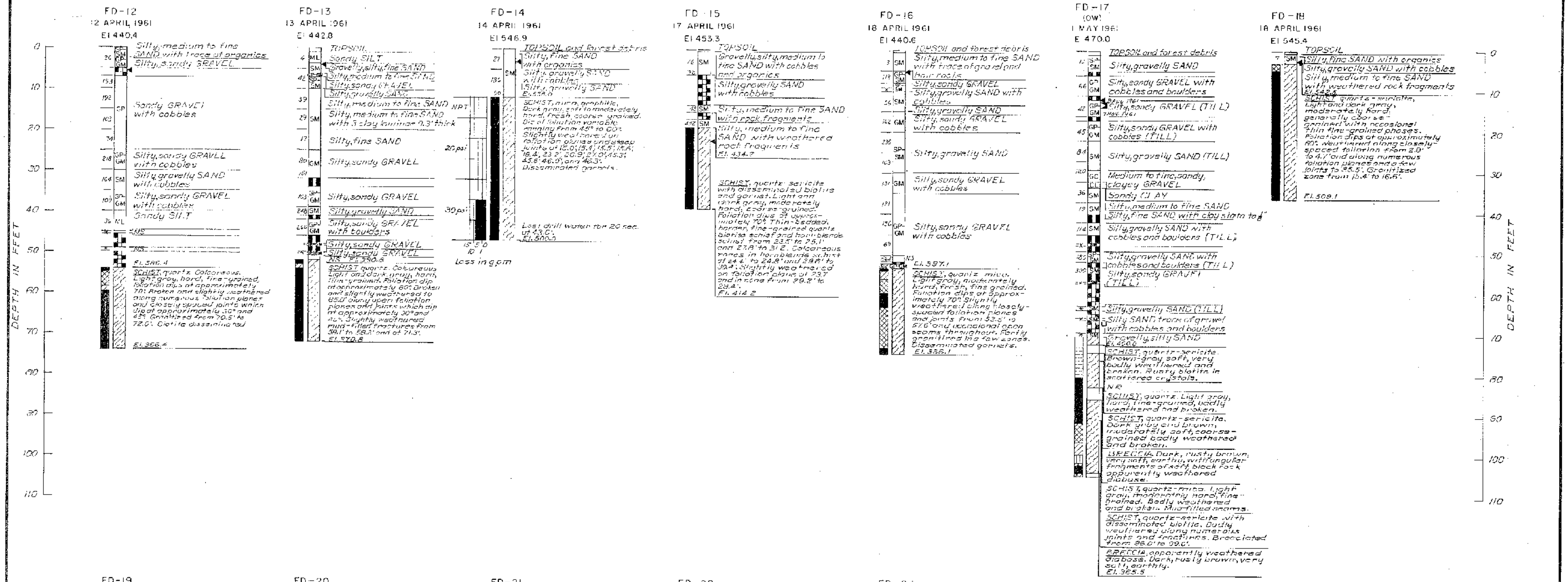
SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

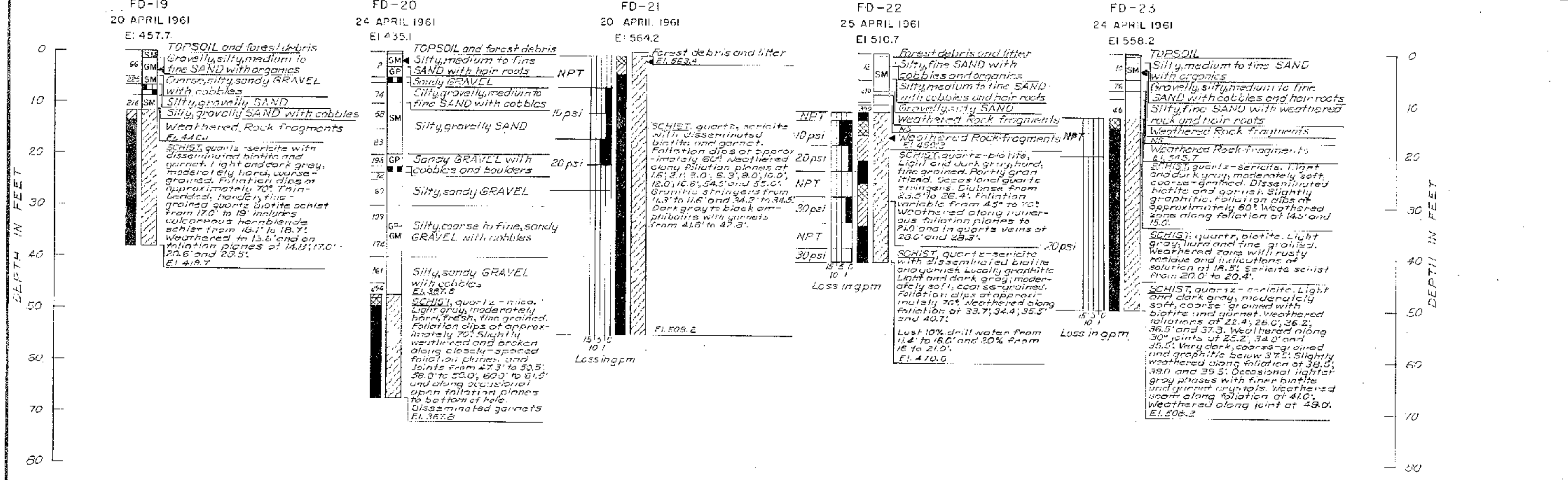
DRAWING NUMBER
CT-2-1500

SHEET 16

CORPS OF ENGINEERS

U. S. ARMY


DEPTH IN FEET
0
10
20
30
40
50
60
70
80
90
100
110
FD-12
12 APRIL 1961
El 440.4
Silty, medium to fine SAND with trace of organics
Silty, sandy GRAVEL
Sandy GRAVEL with cobbles
Silty, sandy GRAVEL with cobbles
Silty, gravelly SAND with cobbles
Silty, sandy GRAVEL with cobbles
Sandy SILT
NS
NS
El. 386.4
SCHIST, quartz. Calcareous. Light gray, hard, fine-grained, foliation dips at approximately 70°. Broken and slightly weathered along numerous foliation planes and closely spaced joints which dip at approximately 30° and 45°. Granitized from 70.5' to 72.0'. Biotite disseminated
El. 366.4
FD-13
13 APRIL 1961
El 442.8
TOPSOIL
Sandy SILT
Gravelly, silty, fine SAND
Silty, medium to fine SAND
Silty, sandy GRAVEL
Silty, gravelly SAND
Silty, medium to fine SAND
Silty, medium to fine SAND with 3 clay laminae 0.3' thick
Silty, fine SAND
Silty, sandy GRAVEL
Silty, sandy GRAVEL
Silty, gravelly SAND
Silty, sandy GRAVEL with boulders
Silty, sandy GRAVEL
Silty, sandy GRAVEL
NS El. 390.8
SCHIST, quartz. Calcareous. Light and dark gray, hard, fine-grained. Foliation dip at approximately 60°. Broken and slightly weathered to 65.0' along open foliation planes and joints which dip at approximately 30° and 45°. Slightly weathered mud-filled fractures from 58.1' to 58.2' and at 71.3'.
El. 370.8
FD-14
14 APRIL 1961
El 546.9
TOPSOIL and forest debris
Silty, fine SAND with organics
Silty, gravelly SAND with cobbles
Silty, gravelly SAND
El. 536.0
SCHIST, mica, graphitic. Dark gray, soft to moderately hard, fresh, coarse-grained. Dip of foliation variable ranging from 45° to 60°. Slightly weathered on foliation planes and steep joints at 15.0', 15.4', 15.5', 15.6', 19.4', 23.2', 26.9', 27.0', 45.3', 45.6', 46.0', and 46.3'. Disseminated garnets.
Lost drill water for 20 sec. at 43.0'.
El. 500.0
NPT
20 psi
30 psi
15 5 0
10 1
Loss in gpm
FD-15
17 APRIL 1961
El 453.3
TOPSOIL
Gravelly, silty, medium to fine SAND with cobbles and organics
Silty, gravelly SAND with cobbles
Silty, medium to fine SAND with rock fragments
Silty, medium to fine SAND with weathered rock fragments
El. 434.7
SCHIST, quartz-sericite with disseminated biotite and garnet. Light and dark gray, moderately hard, coarse-grained. Foliation dips at approximately 70°. Thin-bedded, harder, fine-grained quartz biotite schist and hornblende schist from 23.5' to 25.1' and 27.8' to 31.2'. Calcareous zones in hornblende schist at 24.4' to 24.8' and 28.6' to 30.4'. Slightly weathered on foliation plane at 23.7 and in zone from 29.2' to 29.4'.
El. 414.2
FD-16
18 APRIL 1961
El 440.6
TOPSOIL and forest debris
Silty, medium to fine SAND with trace of gravel and hair roots
Silty, sandy GRAVEL
Silty, gravelly SAND with cobbles
Silty, gravelly SAND
Silty, sandy GRAVEL with cobbles
Silty, gravelly SAND
Silty, sandy GRAVEL with cobbles
Silty, sandy GRAVEL with cobbles
NS
El. 387.1
SCHIST, quartz-mica. Light gray, moderately hard, fresh, fine grained. Foliation dips at approximately 70°. Slightly weathered along closely-spaced foliation planes and joints from 53.5' to 57.6' and occasional open seams throughout. Partly granitized in a few zones. Disseminated garnets.
El. 356.1
FD-17
(OW)
1 MAY 1961
E 470.0
TOPSOIL and forest debris
Silty, gravelly SAND
Silty, sandy GRAVEL with cobbles and boulders
Silty, sandy GRAVEL (TILL)
Silty, sandy GRAVEL with cobbles (TILL)
Silty, gravelly SAND (TILL)
Medium to fine, sandy, clayey GRAVEL
Sandy CLAY
Silty, medium to fine SAND
Silty, fine SAND with clay strata to 1/8"
Silty, gravelly SAND with cobbles and boulders (TILL)
Silty, gravelly SAND with cobbles and boulders (TILL)
Silty, sandy GRAVEL (TILL)
Silty, gravelly SAND (TILL)
Silty SAND trace of gravel with cobbles and boulders
Gravelly, silty SAND
El. 450.0
SCHIST, quartz-sericite. Brown-gray soft, very badly weathered and broken. Rusty biotite in scattered crystals.
NR
SCHIST, quartz. Light gray, hard, fine-grained, badly weathered and broken.
SCHIST, quartz-sericite. Dark gray and brown, moderately soft, coarse-grained badly weathered and broken.
BRECCIA. Dark, rusty brown, very soft, earthy, with angular fragments of soft black rock apparently weathered diabase.
SCHIST, quartz-mica. Light gray, moderately hard, fine-grained. Badly weathered and broken. Mud-filled seams.
SCHIST, quartz-sericite with disseminated biotite. Badly weathered along numerous joints and fractures. Brecciated from 86.0' to 99.0'.
BRECCIA, apparently weathered diabase. Dark, rusty brown, very soft, earthy.
El. 365.5
FD-18
18 APRIL 1961
El 545.4
TOPSOIL
Silty, fine SAND with organics
Silty, gravelly SAND with cobbles
Silty, medium to fine SAND with weathered rock fragments
El. 542.5
SCHIST, quartz-sericite, Light and dark gray, moderately hard, generally coarse-grained with occasional thin fine-grained phases. Foliation dips at approximately 60°. Weathered along closely-spaced foliation from 2.9' to 4.7' and along numerous foliation planes and a few joints to 35.5'. Granitized zone from 15.4' to 16.6'.
El. 509.1


DEPTH IN FEET
0
10
20
30
40
50
60
70
80
FD-19
20 APRIL 1961
El 457.7
TOPSOIL and forest debris
Gravelly, silty, medium to fine SAND with organics
Coarse, silty, sandy GRAVEL with cobbles
Silty, gravelly SAND
Silty, gravelly SAND with cobbles
Weathered Rock fragments
El. 446.1
SCHIST, quartz-sericite with disseminated biotite and garnet. Light and dark grey, moderately hard, coarse-grained. Foliation dips at approximately 70°. Thin-bedded, harder, fine-grained quartz biotite schist from 17.0' to 19' includes calcareous hornblende schist from 18.1' to 18.7'. Weathered to 13.6' and on foliation planes at 14.8', 17.0', 20.6' and 20.5'.
El. 419.7
FD-20
24 APRIL 1961
El 435.1
TOPSOIL and forest debris
Silty, medium to fine SAND with hair roots
Sandy GRAVEL
Silty, gravelly, medium to fine SAND with cobbles
Silty, gravelly SAND
Sandy GRAVEL with cobbles and boulders
Silty, sandy GRAVEL
Silty, coarse to fine, sandy GRAVEL with cobbles
Silty, sandy GRAVEL with cobbles
El. 387.8
SCHIST, quartz-mica. Light gray, moderately hard, fresh, fine grained. Foliation dips at approximately 70°. Slightly weathered and broken along closely-spaced foliation planes, and joints from 47.3' to 50.5', 58.0' to 59.0', 60.0' to 61.5' and along occasional open foliation planes to bottom of hole. Disseminated garnets
El. 367.8
NPT
10 psi
20 psi
15 5 0
10 1
Loss in gpm
FD-21
20 APRIL 1961
El 564.2
Forest debris and litter
El. 563.4
SCHIST, quartz, sericite with disseminated biotite and garnet. Foliation dips at approximately 60°. Weathered along foliation planes at 1.6', 2.1', 3.0', 5.3', 9.0', 10.0', 12.0', 16.6', 54.5' and 55.0'. Granitic stringers from 11.3' to 11.6' and 34.2' to 34.5'. Dark gray to black amphibolite with garnets from 41.6' to 47.3'.
El. 505.2
FD-22
25 APRIL 1961
El 510.7
Forest debris and litter
Silty, fine SAND with cobbles and organics
Silty, medium to fine SAND with cobbles and hair roots
Gravelly, silty SAND
Weathered Rock fragments
NS
Weathered Rock fragments
El. 495.3
SCHIST, quartz-biotite, Light and dark gray, hard, fine grained. Partly granitized. Occasional quartz stringers. Diabase from 25.5' to 26.4'. Foliation variable from 45° to 70°. Weathered along numerous foliation planes to 21.0' and in quartz veins at 28.0' and 28.3'.
SCHIST, quartz-sericite with disseminated biotite and garnet. Locally graphitic. Light and dark gray; moderately soft, coarse-grained. Foliation dips at approximately 70°. Weathered along foliation at 33.7', 34.4', 35.5' and 40.7'.
Lost 10% drill water from 11.4' to 16.0' and 20% from 16' to 21.0'.
El. 470.0
NPT
10 psi
20 psi
NPT
30 psi
NPT
30 psi
15 5 0
10 1
Loss in gpm
FD-23
24 APRIL 1961
El 558.2
TOPSOIL
Silty, medium to fine SAND with organics
Gravelly, silty, medium to fine SAND with cobbles and hair roots
Silty, fine SAND with weathered rock and hair roots
Weathered Rock fragments
NS
Weathered Rock fragments
El. 545.7
SCHIST, quartz-sericite. Light and dark gray, moderately soft, coarse-grained. Disseminated biotite and garnet. Slightly graphitic. Foliation dips at approximately 60°. Weathered zone along foliation at 14.5' and 15.0'.
SCHIST, quartz, biotite. Light gray, hard and fine grained. Weathered zone with rusty residue and indications of solution at 18.5'. Sericite schist from 20.0' to 20.4'.
SCHIST, quartz-sericite. Light and dark gray, moderately soft, coarse grained with biotite and garnet. Weathered foliations at 22.4', 26.0', 36.2', 36.5' and 37.3. Weathered along 30° joints at 25.2', 34.0' and 35.5'. Very dark, coarse-grained and graphitic below 37.5'. Slightly weathered along foliation at 38.5', 39.0 and 39.5'. Occasional lighter gray phases with finer biotite and garnet crystals. Weathered seam along foliation at 41.0'. Weathered along joint at 49.0'.
El. 508.2
NPT
20 psi
15 5 0
10 1
Loss in gpm

NOTES

Elevations refer to Mean Sea Level Datum.

For Location of Foundation Explorations, see Sheet No. 8

For Legend of Graphic Logs and applicable notes, see Sheet No. 14

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY	DR. BY	CK. BY
H.A.V.	R.O.B.	H.A.V.

SUBMITTED
H. A. Hurley
HEAD, GEOLOGY SECTION

PROJECT ENGINEER
J. Marston

APPROVAL RECOMMENDED
CHIEF, FDN & MAT'LS BRANCH

APPROVAL RECOMMENDED
CHIEF, PLAN. & SPECS BRANCH

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

RECORD OF FOUNDATION EXPLORATIONS NO. 2

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION

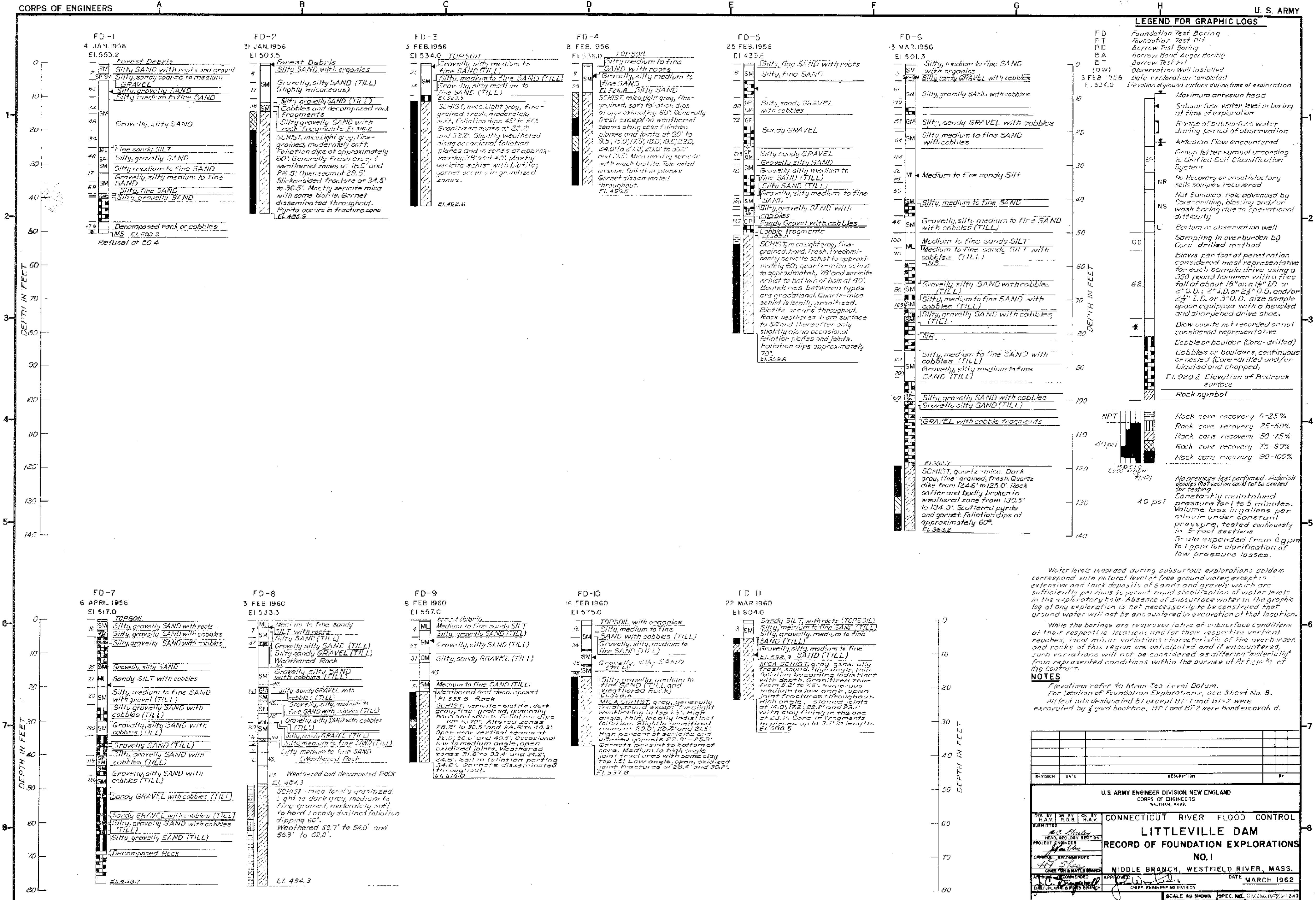
DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-015-62-49

DRAWING NUMBER
CT-2-1499

SHEET 15

CORPS OF ENGINEERS — U. S. ARMY


A
B
C
D
E
F
G
H
1
2
3
4
5
6
7
8
DEPTH IN FEET
FD-1
4 JAN.1956
El.553.2
Forest Debris
Silty SAND with roots and gravel
Silty, sandy coarse to medium GRAVEL
Silty, gravelly SAND
Silty medium to fine SAND
Gravelly, silty SAND
Fine sandy SILT
Silty, gravelly SAND
Silty medium to fine SAND
Gravelly, silty medium to fine SAND
Silty, fine SAND
Silty, gravelly SAND
Decomposed rock or cobbles
NS El.503.2
Refusal at 50.4
FD-2
31 JAN.1956
El 503.5
Forest Debris
Silty SAND with organics
Gravelly, silty SAND (TILL) (Highly micaceous)
Silty gravelly SAND (TILL)
Cobbles and decomposed rock fragments
Silty gravelly SAND with rock fragments El.516.2
SCHIST, mica. Light gray, fine-grained, moderately soft. Foliation dips at approximately 60°. Generally fresh except weathered zones at 16.5' and 26.5'. Open seam at 29.5'. Slickensided fracture at 34.5' to 36.5'. Mostly sericite mica with some biotite. Garnet disseminated throughout. Pyrite occurs in fracture zone El.485.9
FD-3
5 FEB.1956
El 534.0
TOPSOIL
Gravelly, silty medium to fine SAND (TILL)
Silty, medium to fine SAND (TILL)
Gravelly, silty medium to fine SAND (TILL)
El.523.5
SCHIST, mica. Light gray, fine-grained fresh, moderately soft. Foliation dips 45° to 60°. Granitized zones at 22.2' and 32.2'. Slightly weathered along occasional foliation planes and in zones at approximately 29' and 40'. Mostly sericite schist with biotite; garnet occurs in granitized zones.
El.482.6
FD-4
8 FEB.1956
El 536.0
TOPSOIL
Silty medium to fine SAND with roots
Gravelly, silty medium to fine SAND
El.526.8 Silty SAND
SCHIST, mica. Light gray, fine-grained, soft. Foliation dips of approximately 60°. Generally fresh except on weathered seams along open foliation planes and joints at 9.0' to 9.5'; 15.0'; 17.5'; 18.0'; 19.5'; 23.0, 24.0' to 27.0'; 29.0' to 30.0' and 31.5'. Mica mostly sericite with much biotite. Talc noted on some foliation planes. Garnet disseminated throughout.
El.459.5
FD-5
25 FEB.1956
El 433.6
Silty, fine SAND with roots
Silty, fine SAND
Silty, sandy GRAVEL with cobbles
Sandy GRAVEL
Silty sandy GRAVEL
Gravelly silty SAND
Gravelly silty medium to fine SAND (TILL)
Silty SAND (TILL)
Gravelly, silty medium to fine SAND
Silty, gravelly SAND with cobbles
Sandy Gravel with cobbles
Cobble fragments
El.389.6
SCHIST, mica. Light gray, fine-grained, hard, fresh. Predominantly sericite schist to approximately 60'; quartz-mica schist to approximately 78' and sericite schist to bottom of hole at 80'. Boundaries between types are gradational. Quartz-mica schist is locally granitized. Biotite occurs throughout. Rock weathered from surface to 54' and thereafter only slightly along occasional foliation planes and joints. Foliation dips approximately 70°.
El.359.6
FD-6
13 MAR.1956
El 501.3
Silty, medium to fine SAND with organics
Silty sandy GRAVEL with cobbles
Silty, gravelly SAND with cobbles
Silty, sandy GRAVEL with cobbles
Silty medium to fine SAND with cobbles
Medium to fine sandy Silt
Silty, medium to fine SAND
Gravelly, silty medium to fine SAND with cobbles (TILL)
Medium to fine sandy SILT
Medium to fine sandy SILT with cobbles (TILL)
NS
Gravelly silty SAND with cobbles (TILL)
Silty, medium to fine SAND with cobbles (TILL)
Silty, gravelly SAND with cobbles (TILL)
NR
Silty, medium to fine SAND with cobbles (TILL)
Gravelly, silty medium to fine SAND (TILL)
Silty, gravelly SAND with cobbles
Gravelly silty SAND (TILL)
GRAVEL with cobble fragments
El.380.7
SCHIST, quartz-mica. Dark gray, fine-grained, fresh. Quartz dike from 124.6' to 125.0'. Rock softer and badly broken in weathered zone from 130.5' to 134.0'. Scattered pyrite and garnet. Foliation dips of approximately 60°.
El.363.2
LEGEND FOR GRAPHIC LOGS
FD Foundation Test Boring
FT Foundation Test Pit
BD Borrow Test Boring
BA Borrow Hand Auger Boring
BT Borrow Test Pit
(OW) Observation Well installed
5 FEB 1956 Date exploration completed
El.534.0 Elevation of ground surface during time of exploration
Maximum artesian head
Subsurface water level in boring at time of exploration
Range of subsurface water during period of observation
Artesian flow encountered
SP Group letter symbol according to Unified Soil Classification System
NR No Recovery or unsatisfactory soils samples recovered
NS Not Sampled. Hole advanced by Core-drilling, blasting and/or wash boring due to operational difficulty
Bottom of observation well
CD Sampling in overburden by Core drilled method
62 Blows per foot of penetration considered most representative for each sample drive using a 350 pound hammer with a free fall of about 18" on a 1½" I.D. or 2" O.D.; 2" I.D. or 2½" O.D. and/or 2½" I.D. or 3" O.D. size sample spoon equipped with a beveled and sharpened drive shoe.
* Blow counts not recorded or not considered representative
Cobble or boulder (Core-drilled)
Cobbles or boulders, continuous or nested (Core-drilled and/or blasted and chopped,
El.920.2 Elevation of Bedrock surface
Rock symbol
Rock core recovery 0-25%
Rock core recovery 25-50%
Rock core recovery 50-75%
Rock core recovery 75-90%
Rock core recovery 90-100%
NPT
40 psi
1.5 1.0 .5 1.0
Loss in gpm
No pressure test performed. Asterisk denotes that section could not be sealed for testing
40 psi Constantly maintained pressure for 1 to 5 minutes.
Volume loss in gallons per minute under constant pressure, tested continuously in 5-foot sections
Scale expanded from 0 gpm to 1 gpm for clarification of low pressure losses.
FD-7
6 APRIL 1956
El 517.0
TOPSOIL
Silty, gravelly SAND with roots
Silty, gravelly SAND with cobbles
Silty, gravelly SAND with cobbles
Gravelly, silty SAND
Sandy SILT with cobbles
Silty, medium to fine SAND with gravel (TILL)
Silty gravelly SAND with cobbles (TILL)
Gravelly, silty SAND with cobbles (TILL)
Gravelly SAND (TILL)
Silty, gravelly SAND with cobbles (TILL)
Gravelly, silty SAND with cobbles (TILL)
Sandy GRAVEL with cobbles (TILL)
Sandy GRAVEL with cobbles (TILL)
Silty, gravelly SAND with cobbles (TILL)
Silty, gravelly SAND (TILL)
Decomposed Rock
El.430.7
FD-8
3 FEB 1960
El 533.3
Medium to fine sandy SILT with roots
Silty SAND (TILL)
Gravelly silty SAND (TILL)
Silty sandy GRAVEL (TILL)
Weathered Rock
NS
Gravelly, silty SAND with cobbles (TILL)
Silty, sandy GRAVEL with cobbles (TILL)
Gravelly, silty, medium to fine SAND with cobbles (TILL)
Gravelly, silty SAND with cobbles (TILL)
Silty, sandy GRAVEL (TILL)
Silty medium to fine SAND (TILL)
Silty medium to fine SAND (Weathered Rock)
Weathered and decomposed ROCK
El.484.3
SCHIST - mica locally granitized. Light to dark gray, medium to fine-grained, moderately soft to hard. Locally distinct foliation dipping 60°.
Weathered 53.7' to 54.0' and 56.9' to 62.0'.
El.454.3
FD-9
5 FEB 1960
El 557.0
Forest debris
Medium to fine sandy SILT
Silty, gravelly SAND (TILL)
Gravelly, silty SAND (TILL)
Silty, sandy GRAVEL (TILL)
NS
Medium to fine SAND (TILL)
Weathered and decomposed
El.535.8 Rock
SCHIST, sericite-biotite, dark gray, fine-grained, generally hard and sound. Foliation dips 60° to 70°. Altered zones 28.2' to 30.5' and 38.8' to 40.3'. Open near vertical seams at 22.0', 30.0' and 40.5'. Occasional low to medium angle, open oxidized joints. Weathered zones 31.6' to 33.4' and 34.2', 34.8'. Soil in foliation parting 34.8'. Garnets disseminated throughout.
El.519.2
FD-10
16 FEB 1960
El 575.0
TOPSOIL with organics
Silty, medium to fine SAND with cobbles (TILL)
Gravelly, silty, medium to fine SAND (TILL)
Gravelly, silty SAND (TILL)
Silty gravelly medium to fine SAND (TILL and weathered Rock)
El.558.4
MICA SCHIST, gray, generally fresh, sound except for slight weathering in top 1.5'. High angle, thin, locally indistinct foliation. Slightly granitized zones at 20.0', 20.7' and 21.5'. High percent of sericite and altered garnets 22.0'-25.9'. Garnets persist to bottom of core. Medium to high angle joint fractures with some clay top 1.5'. Low angle, open, oxidized joint fractures at 29.4' and 30.2'.
El.537.8
FD-11
22 MAR 1960
El 604.0
Sandy SILT, with roots (TOPSOIL)
Silty, medium to fine SAND (TILL)
Silty, gravelly, medium to fine SAND (TILL)
Gravelly, silty, medium to fine SAND (TILL)
El.598.3
MICA SCHIST, gray, generally fresh, sound. High angle, thin foliation becoming indistinct with depth. Granitized zone from 5.2' to 7.5'. Numerous medium to low angle, open joint fractures throughout. High angle, stained joints at 14.0', 17.2', 22.8' and 23.1' with clay filling in the one at 23.1'. Core in fragments to pieces up to 3.1' in length.
El.580.5

Water levels recorded during subsurface explorations seldom correspond with natural level of free ground water, except in extensive and thick deposits of sands and gravels which are sufficiently pervious to permit rapid stabilization of water levels in the exploratory hole. Absence of subsurface water in the graphic log of any exploration is not necessarily to be construed that ground water will not be encountered in excavation at that location.

While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local minor variations characteristic of the overburden and rocks of this region are anticipated and if encountered, such variations will not be considered as differing "materially" from represented conditions within the purview of Article 4 of the Contract.

NOTES

Elevations refer to Mean Sea Level Datum.

For location of Foundation Explorations, see Sheet No. 8.

All test pits designated BT except BT-1 and BT-2 were excavated by ⅜ yard backhoe. BT-1 and BT-2 were hand excavated.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.A.V. | DR. BY R.D.B. | CK. BY H.A.V.

SUBMITTED: H.C. Hurley, HEAD, GEOLOGY SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED: H.F. Sheer, CHIEF, F&N & MAT'LS BRANCH
APPROVAL RECOMMENDED: J.C. Bingwell, CHIEF, PLANN. & REPTS BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
RECORD OF FOUNDATION EXPLORATIONS
NO. I

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

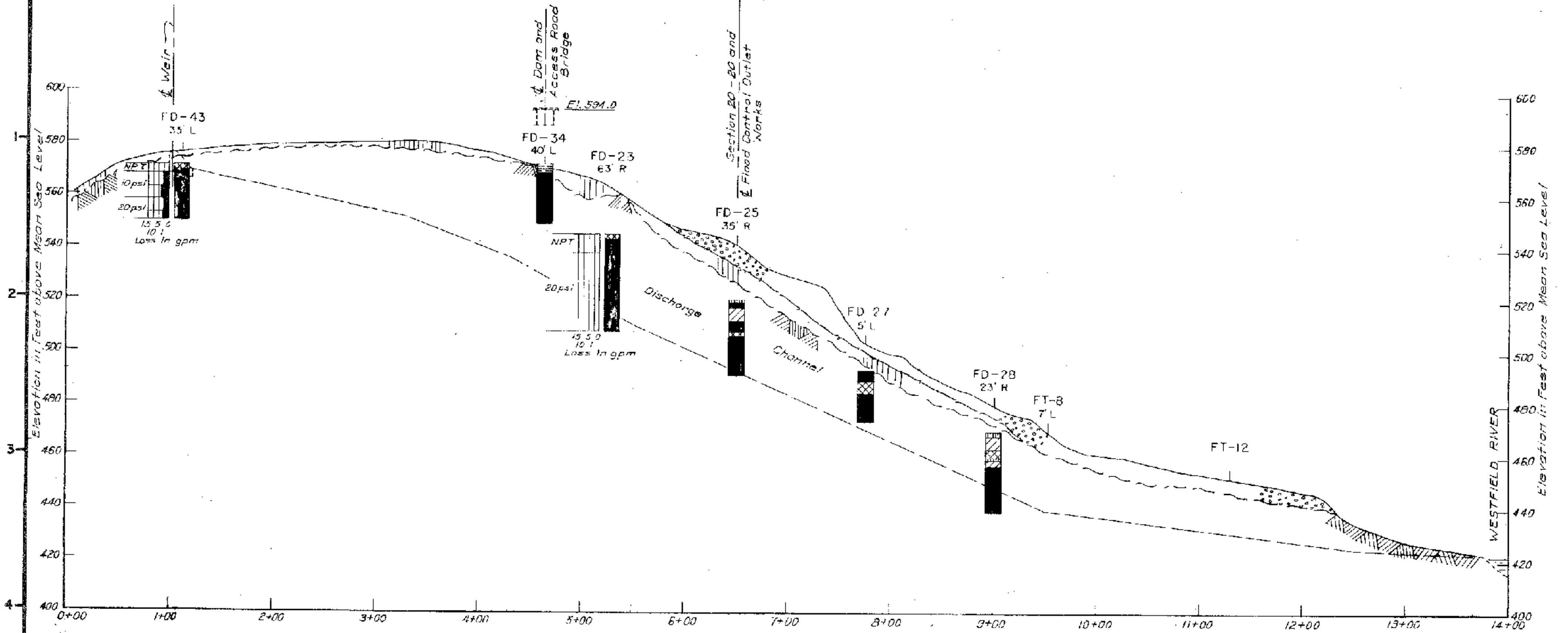
APPROVED: CHIEF, ENGINEERING DIVISION — DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-249

DRAWING NUMBER CT-2-1498

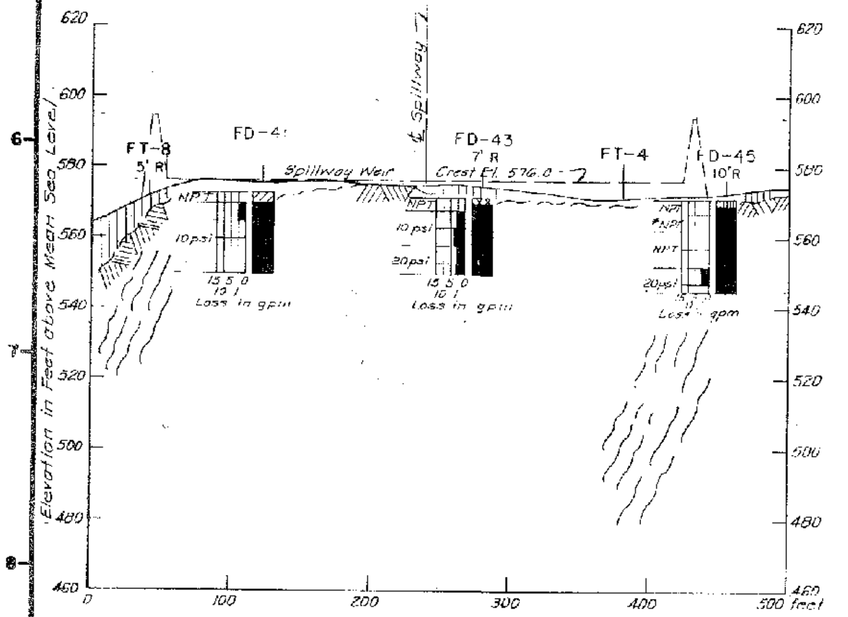
SHEET 14

CORPS OF ENGINEERS U. S. ARMY



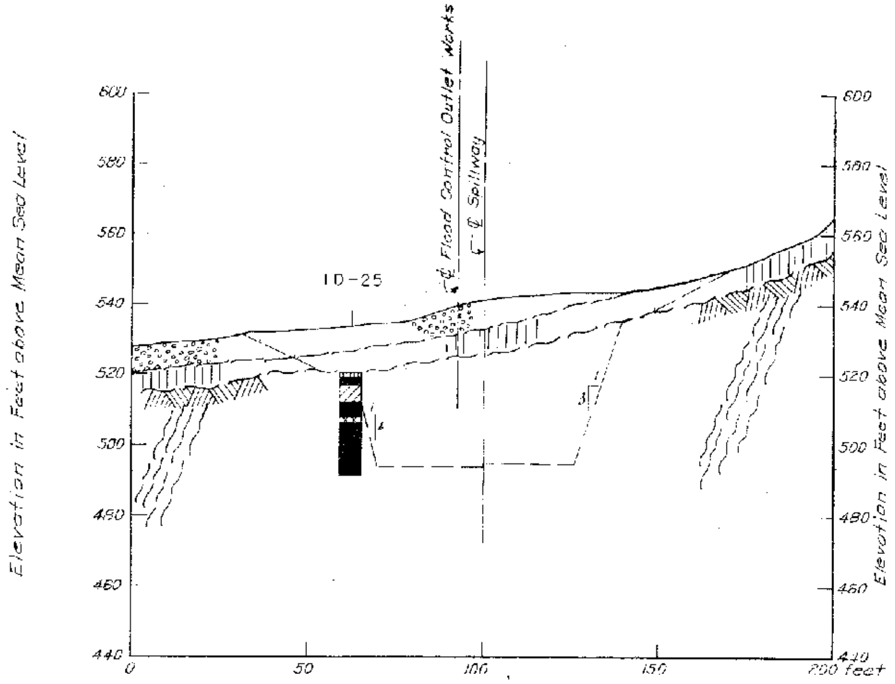
SECTION 18 – 18, ALONG ℄ SPILLWAY

(LOOKING EAST)



SECTION 19 – 19, ALONG ℄ WEIR

(LOOKING NORTH)


℄ Flood Control Outlet Works
℄ Spillway
FD-25
Elevation in Feet above Mean Sea Level
600
580
560
540
520
500
480
460
440
0
50
100
150
200 feet

SECTION 20 – 20, AT STA. 6+50

(LOOKING NORTH)

NOTES

For Location of Sections, see Sheet No. 8

For Record of Foundation Explorations see Sheet No's 14, 15, 16, 17, 18 and 19.

For Legend of Geologic Symbols, see Sheet No. 9

For notes applicable to Geologic Sections, see Sheet No. 9

For Legend of Core Boring in Rock, see Sheet No. 10

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.A.V. | DR. BY R.D.B. | CK. BY H.A.V.

SUBMITTED
HEAD, GEOLOGY SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, FDN & MAT'LS BRANCH

APPROVAL RECOMMENDED
CHIEF, PLAN. & M'T'S BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY
GEOLOGIC-LOG SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION

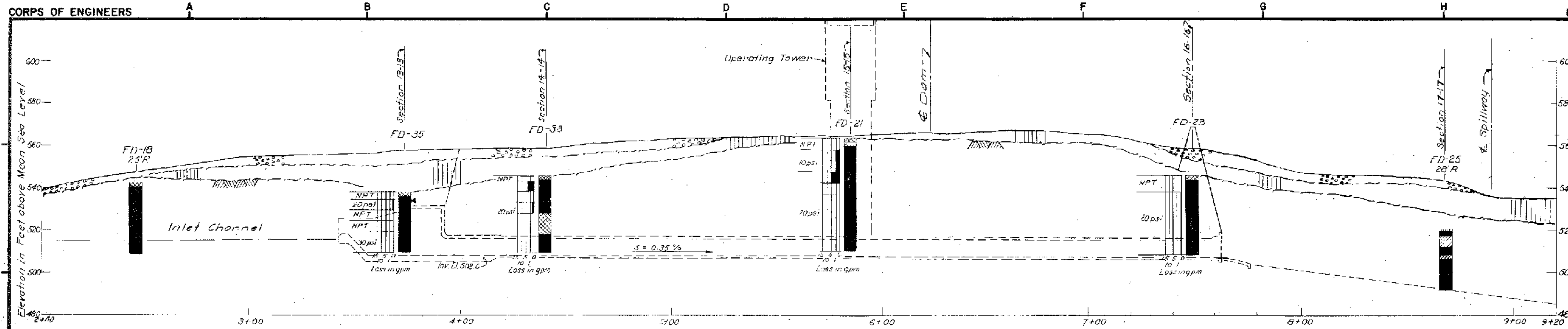
DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-2-1497

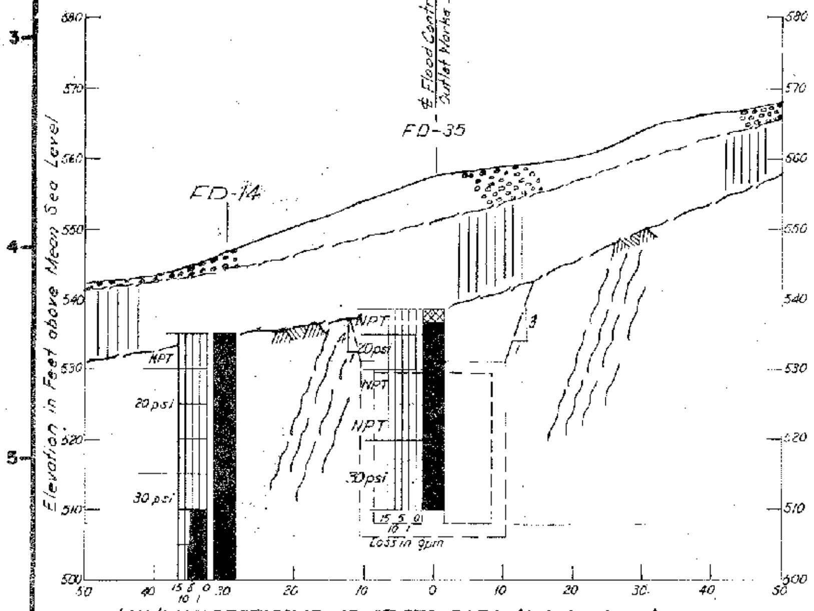
SHEET 13

CORPS OF ENGINEERS　U. S. ARMY



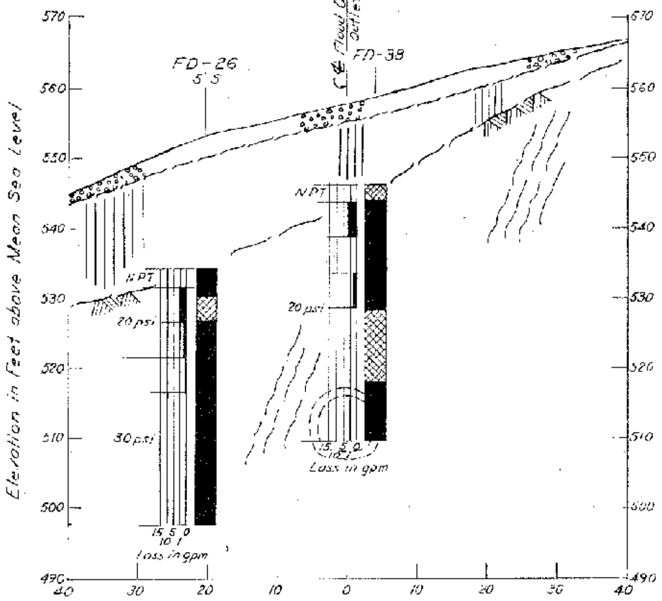
SECTION 12-12, ALONG ℄ FLOOD CONTROL OUTLET WORKS

(LOOKING EAST)


Elevation in Feet above Mean Sea Level
FD-14
FD-35
℄ Flood Control Outlet Works
NPT
20 psi
30 psi
Loss in gpm

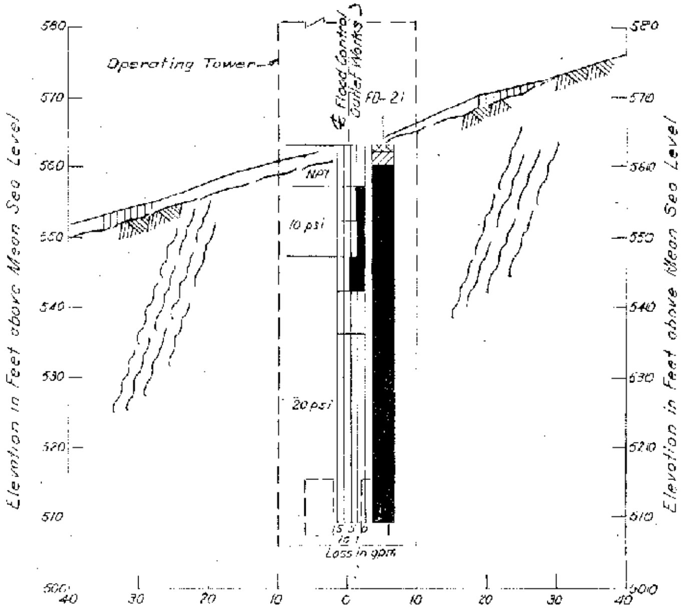
SECTION 13-13, AT STA. 3+74 *(Intake Area)*

(LOOKING NORTH)


Elevation in Feet above Mean Sea Level
FD-26
5'S
℄ Flood Control Outlet Works
FD-38
NPT
20 psi
30 psi
Loss in gpm

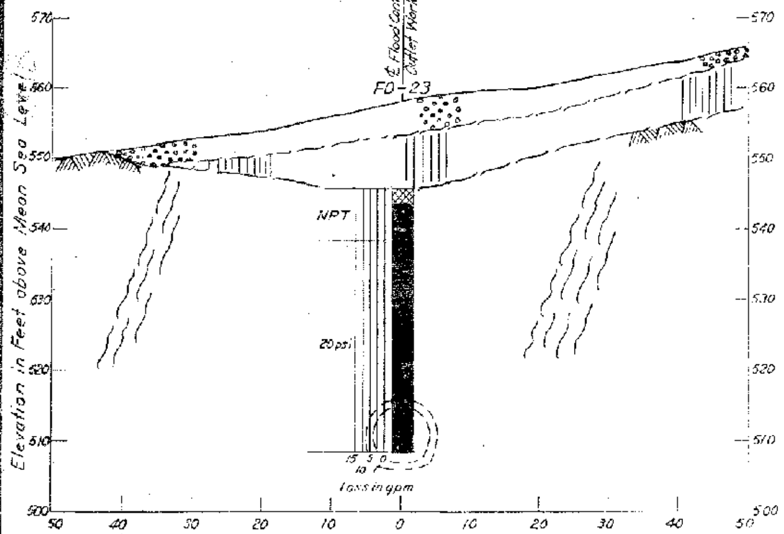
SECTION 14-14, AT STA. 4+41

(LOOKING NORTH)


Elevation in Feet above Mean Sea Level
Operating Tower
℄ Flood Control Outlet Works
FD-21
NPT
10 psi
20 psi
Loss in gpm

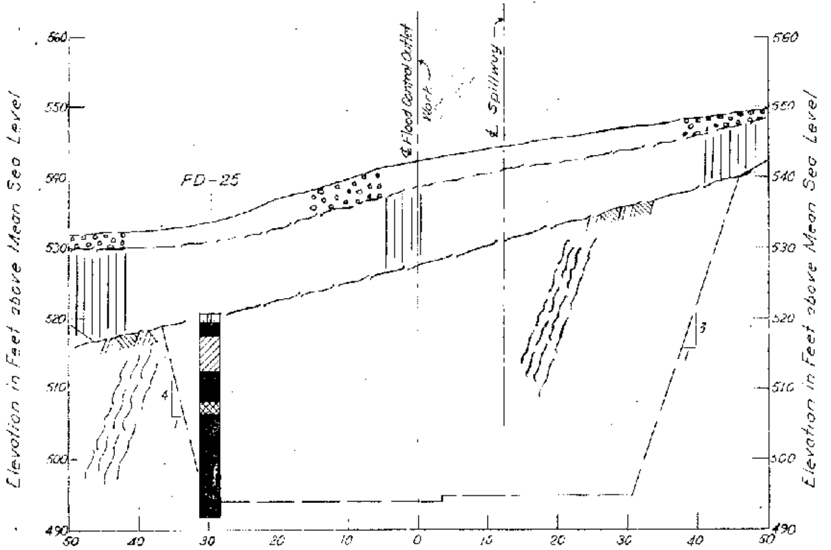
SECTION 15-15, AT STA. 5+85 *(Tower and Transition)*

(LOOKING NORTH)


Elevation in Feet above Mean Sea Level
℄ Flood Control Outlet Works
FD-23
NPT
20 psi
Loss in gpm

SECTION 16-16, AT STA. 7+49

(LOOKING NORTH)


Elevation in Feet above Mean Sea Level
FD-25
℄ Flood Control Outlet Works
℄ Spillway

SECTION 17-17, AT STA. 8+68 *(Outlet Area)*

(LOOKING NORTH)

NOTES

For Location of Sections, see Sheet No. 8
For Record of Foundation Explorations, see Sheet No's. 14, 15, 16, 17, 18 and 19
For Legend of Geologic Symbols, see Sheet No. 9
For notes applicable to Geologic Sections, see Sheet No. 9
For Legend of Core Boring in Rock, see Sheet No. 10

REVISION	DATE	DESCRIPTION	BY

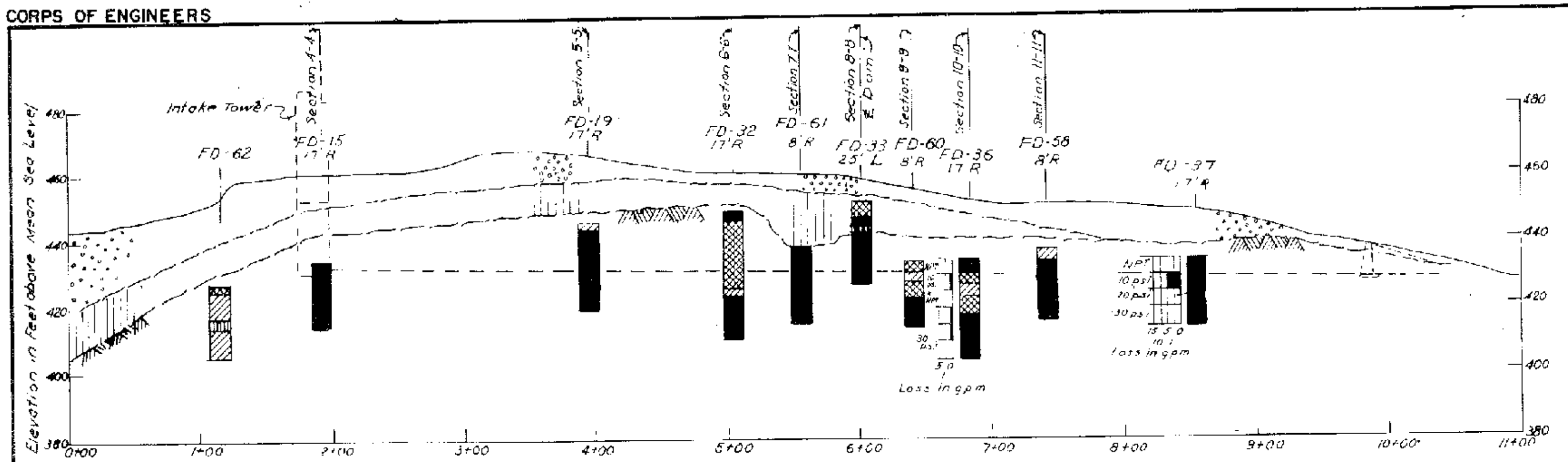
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.A.V.　DR. BY R.A.W.　CK. BY H.A.V.
SUBMITTED
HEAD, GEOLOGY SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, FDN. & MAT'LS. BRANCH
APPROVAL RECOMMENDED
CHIEF, PLANS & R'E'S BRANCH

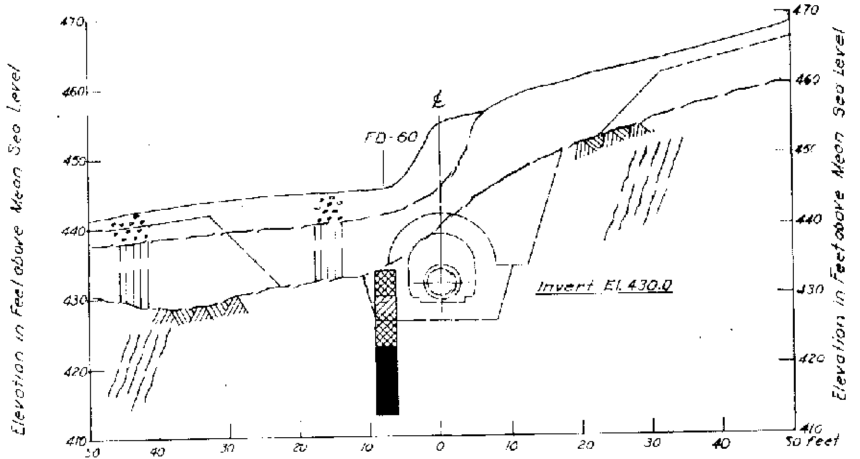
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL OUTLET WORKS
GEOLOGIC-LOG SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

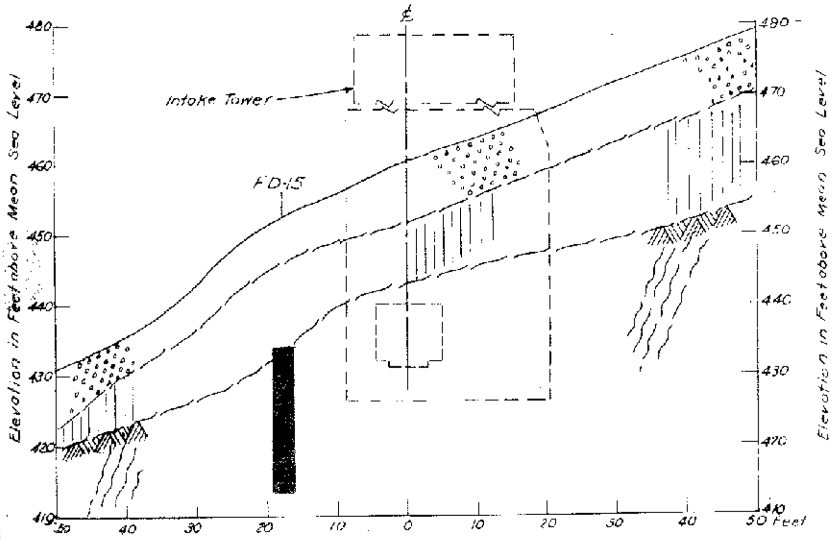
SCALE AS SHOWN　SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-2-1496
SHEET 12



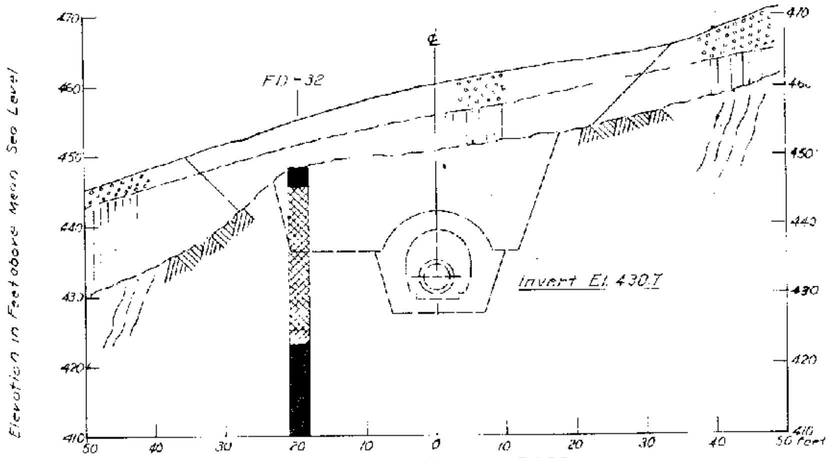
SECTION 3-3, ALONG ℄ WATER SUPPLY OUTLET WORKS
(LOOKING EAST)



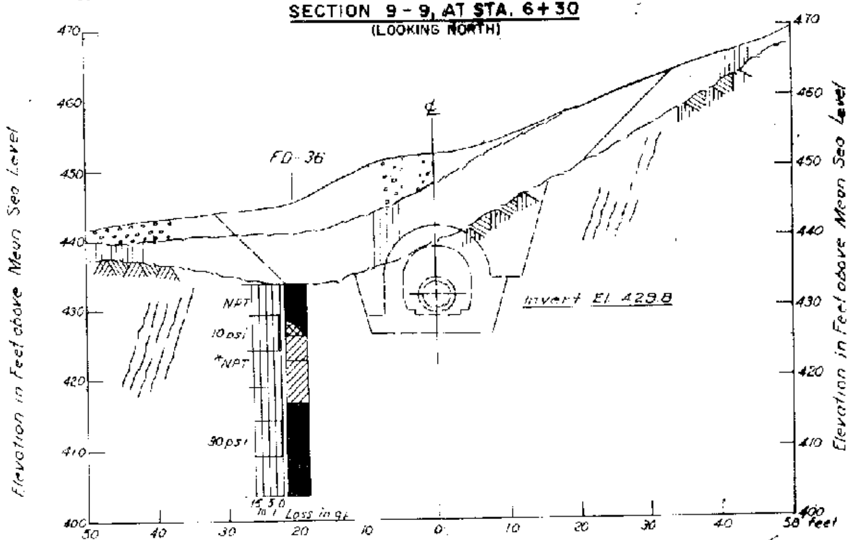
SECTION 9-9, AT STA. 6+30
(LOOKING NORTH)



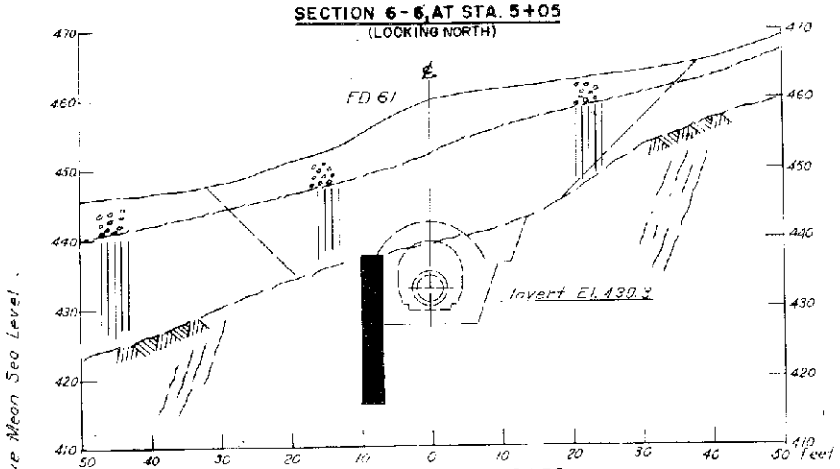
SECTION 4-4, AT STA. 1+95
(LOOKING NORTH)



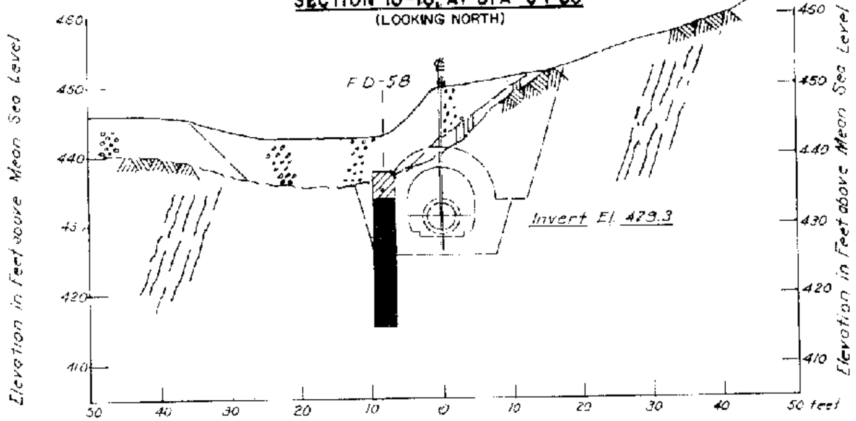
SECTION 6-6, AT STA. 5+05
(LOOKING NORTH)



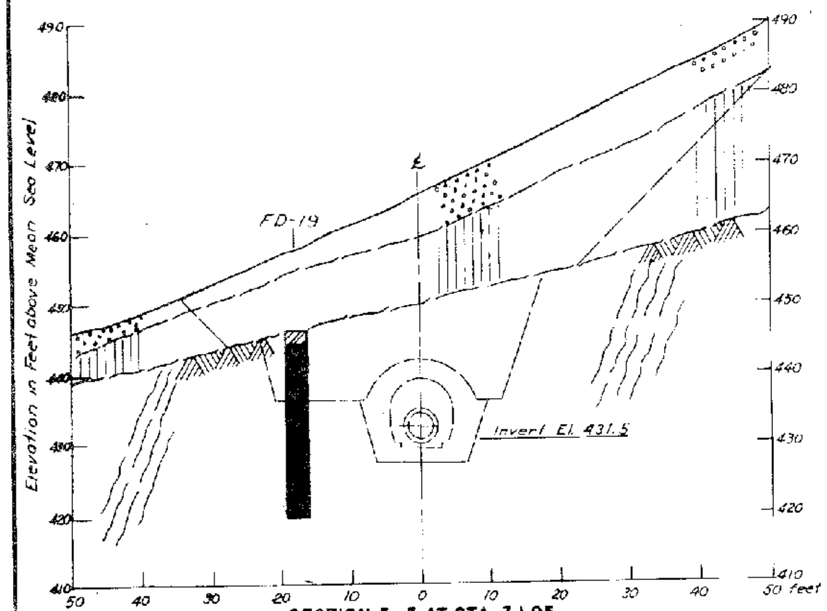
SECTION 10-10, AT STA 6+80
(LOOKING NORTH)



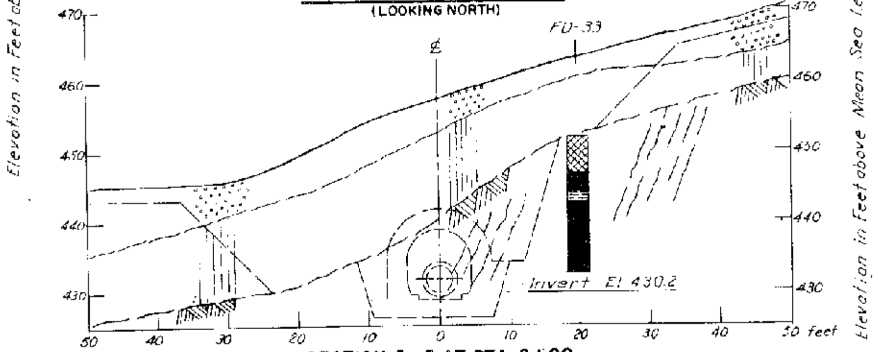
SECTION 7-7, AT STA. 5+55
(LOOKING NORTH)



SECTION 11-11, AT STA. 7+40
(LOOKING NORTH)



SECTION 5-5, AT STA. 3+95
(LOOKING NORTH)



SECTION 8-8, AT STA. 6+00
(LOOKING NORTH)

NOTES

For Location of Sections, Sheet No. 8
For Record of Foundation Explorations, see Sheet Nos. 14, 15, 16, 17, 18 and 19.
For Legend of Geologic Symbols, see Sheet No. 9
For notes applicable to Geologic Sections, see Sheet No. 9
For Legend of Core Boring in Rock, see Sheet No. 10

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

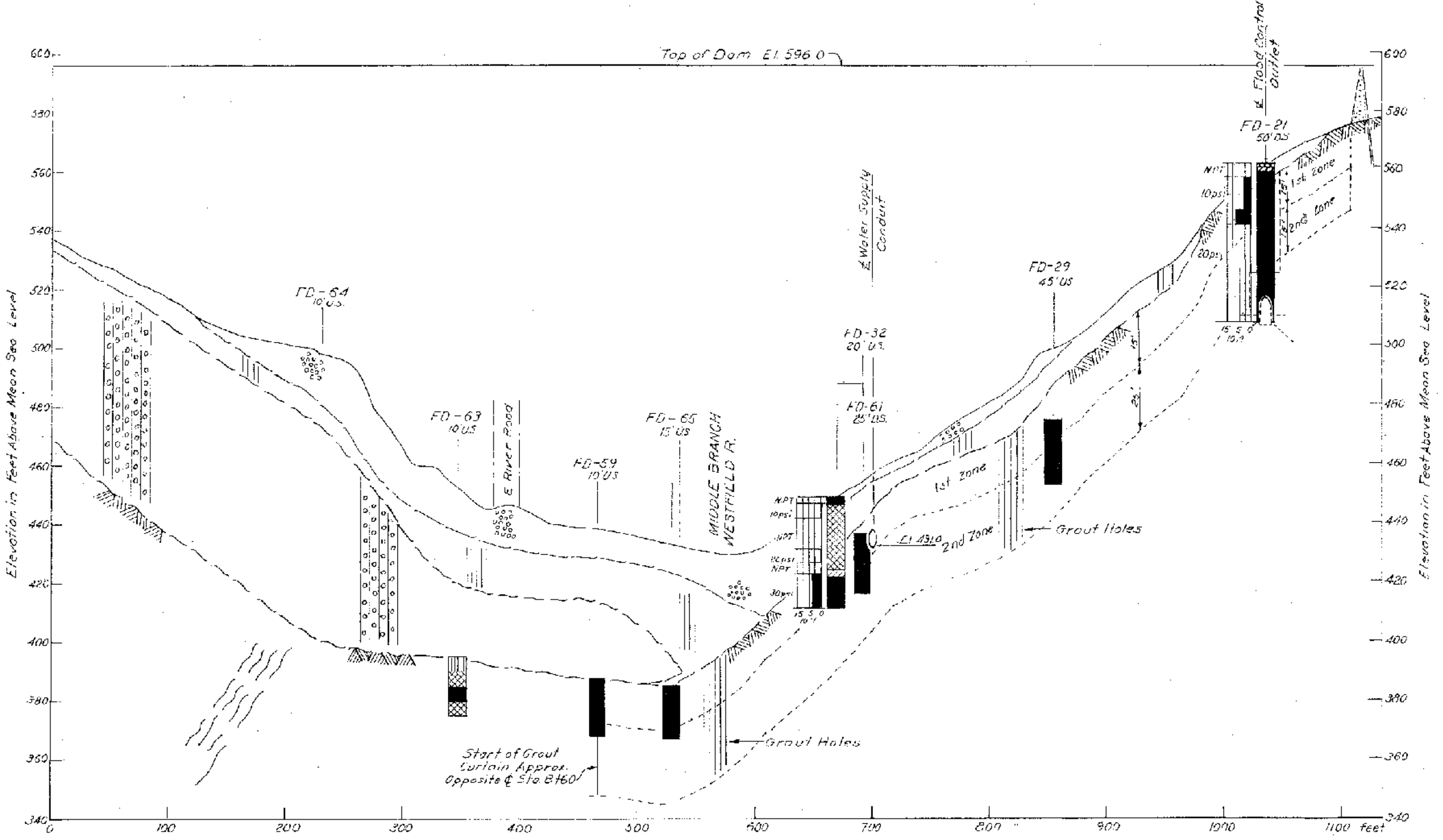
DES. BY	DR. BY	CK. BY
H.A.V.	R.A.W.	H.A.V.

SUBMITTED
R. C. Gurley
HEAD, GEOLOGY SECTION
PROJECT ENGINEER
J. Hartley
APPROVAL RECOMMENDED
H. Fisher
CHIEF, FDN & MAT'LS BRANCH
APPROVAL RECOMMENDED
J. C. Dougnell
CHIEF, PLANNING & BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY OUTLET WORKS
GEOLOGIC-LOG SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN SPEC. NO. CIVENG-19-015-62-49
DRAWING NUMBER
CT-2-1495
SHEET 11



SECTION 2-2

(LOOKING UPSTREAM)

LEGEND FOR CORE BORING IN ROCK

FD-32 Foundation Test Boring
20' U.S. Distance and direction of offset

NPT	▤ 0-25% Rock core recovery
10 psi	▥ 25-50% Rock core recovery
*NPT	▨ 50-75% Rock core recovery
30 psi	▩ 75-90% Rock core recovery
	■ 90-100% Rock core recovery

15 5 0
10 1
Loss in gpm

*NPT	No pressure test performed. Asterisk denotes that section could not be sealed for testing.
20 psi	Constantly maintained pressure for 1 to 5 minutes. Volume loss in gallons per minute under constant pressure, tested continuously in 5-foot sections. Scale expanded from 0 gpm to 1 gpm for clarification of low pressure losses.

NOTES

For Location of Section, see Sheet No. 8
For Record of Foundation Explorations, see Sheet No's 14, 15, 16, 17, 18, and 19.
For Legend of Geologic Symbols, see Sheet No. 9
For notes applicable to Geologic Sections, see Sheet No. 9

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

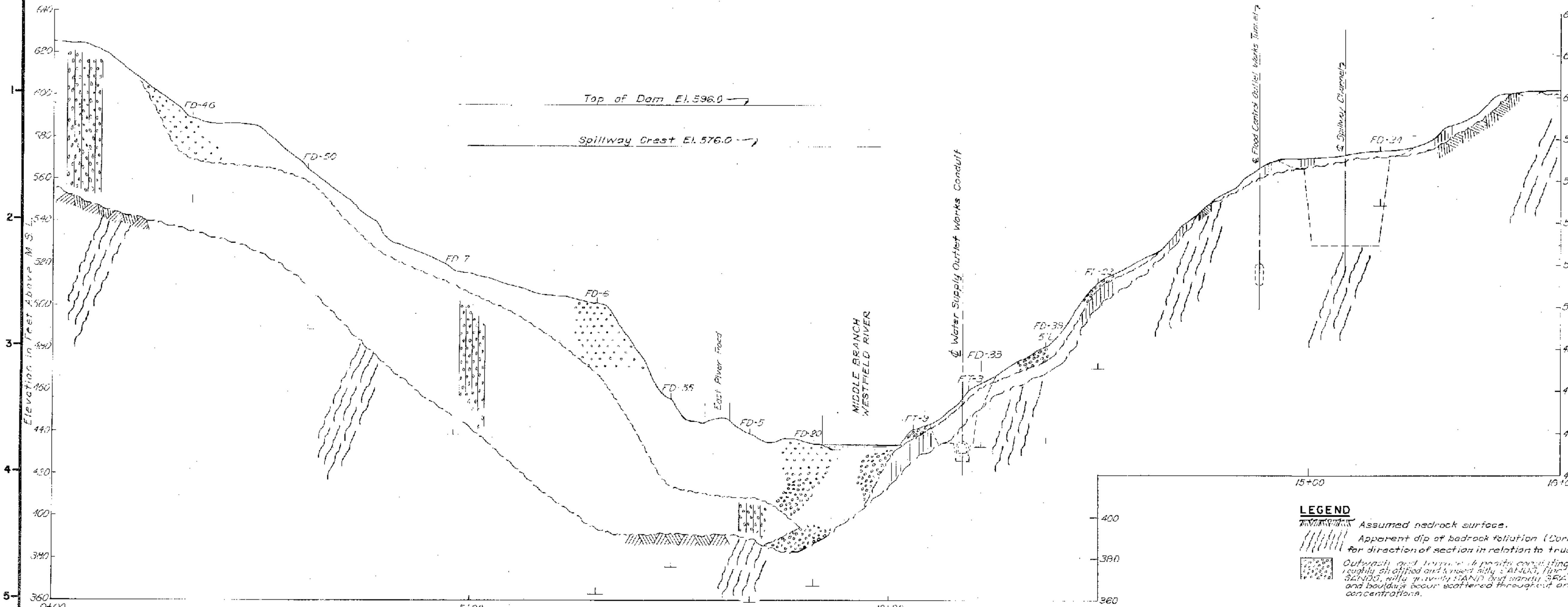
DES. BY H.A.V. | DR. BY R.A.W. | CH. BY H.A.V.
SUBMITTED
HEAD, GEOLOGY SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, FDN & MAT'LS BRANCH
APPROVAL RECOMMENDED
CHIEF, ENGINEERING BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
CUT-OFF TRENCH
GEOLOGIC-LOG SECTION
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

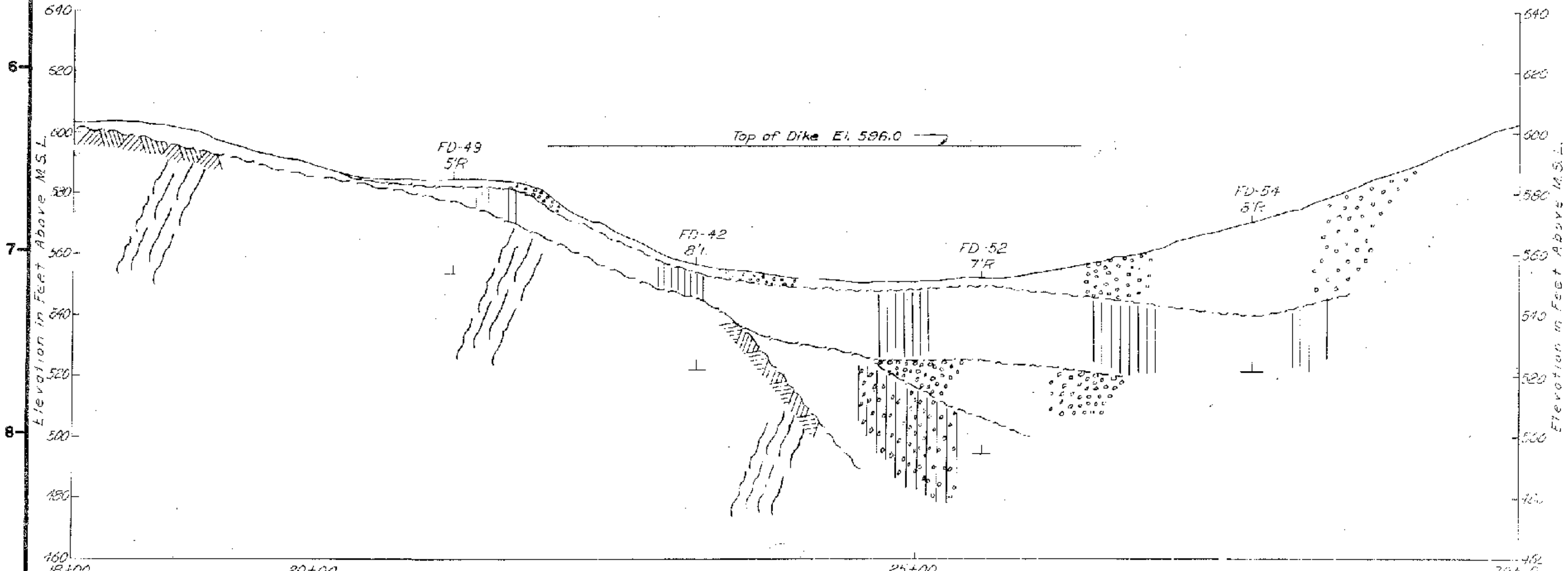
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-45
DRAWING NUMBER
CT-2-1494
SHEET 10

CORPS OF ENGINEERS | U. S. ARMY



SECTION I-I, ALONG ℄ DAM AND DIKE
(LOOKING NORTH)



SECTION I-I, ALONG ℄ DAM AND DIKE *(Continued)*
(LOOKING NORTH)

LEGEND

▨	Assumed bedrock surface.
⫽	Apparent dip of bedrock foliation (Corrected for direction of section in relation to true dip)
⠿	Outwash and terrace deposits consisting of variable, roughly stratified and lensed silty SANDS, fine to coarse SANDS, silty gravelly SAND and sandy GRAVEL. Cobble and boulders occur scattered throughout and in local concentrations.
▥	Sandy TILL and TILL-LIKE materials ranging from gravelly SANDS and silty, sandy GRAVEL to gravelly silty SAND. Cobbles and boulders occur scattered throughout and in local concentrations. Also includes some zones of weathered bedrock.
▦	TILL - Variable gravelly, silty SAND, with numerous cobbles and boulders
	Bedrock consists mainly of graphitic and locally calcareous quartz sericite SCHIST with many thin beds of quartzitic, biotite and hornblend SCHIST.

NOTES

For Location of Sections, see Sheet No. 8

For Record of Foundation Explorations, see Sheet Nos. 14, 15, 16, 17, 18 and 19.

These geologic sections are presented for general information and are to be considered only as a supplement to the records of explorations in other contract drawings. Geologic sections shown hereon are the Government interpretation of subsurface conditions believed to exist at and between borings. Variations between elevations, composition and structure of the individual formations as represented hereon and as actually encountered in the progress of work are to be anticipated.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CH. BY
H.A.V.	H.T.P.	H.A.V.

SUBMITTED
HEAD, GEOLOGY SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF FDN & MAT'LS BRANCH

APPROVAL RECOMMENDED
CHIEF, PLAN & RPTS BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
DAM AND DIKE
GEOLOGIC SECTION
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

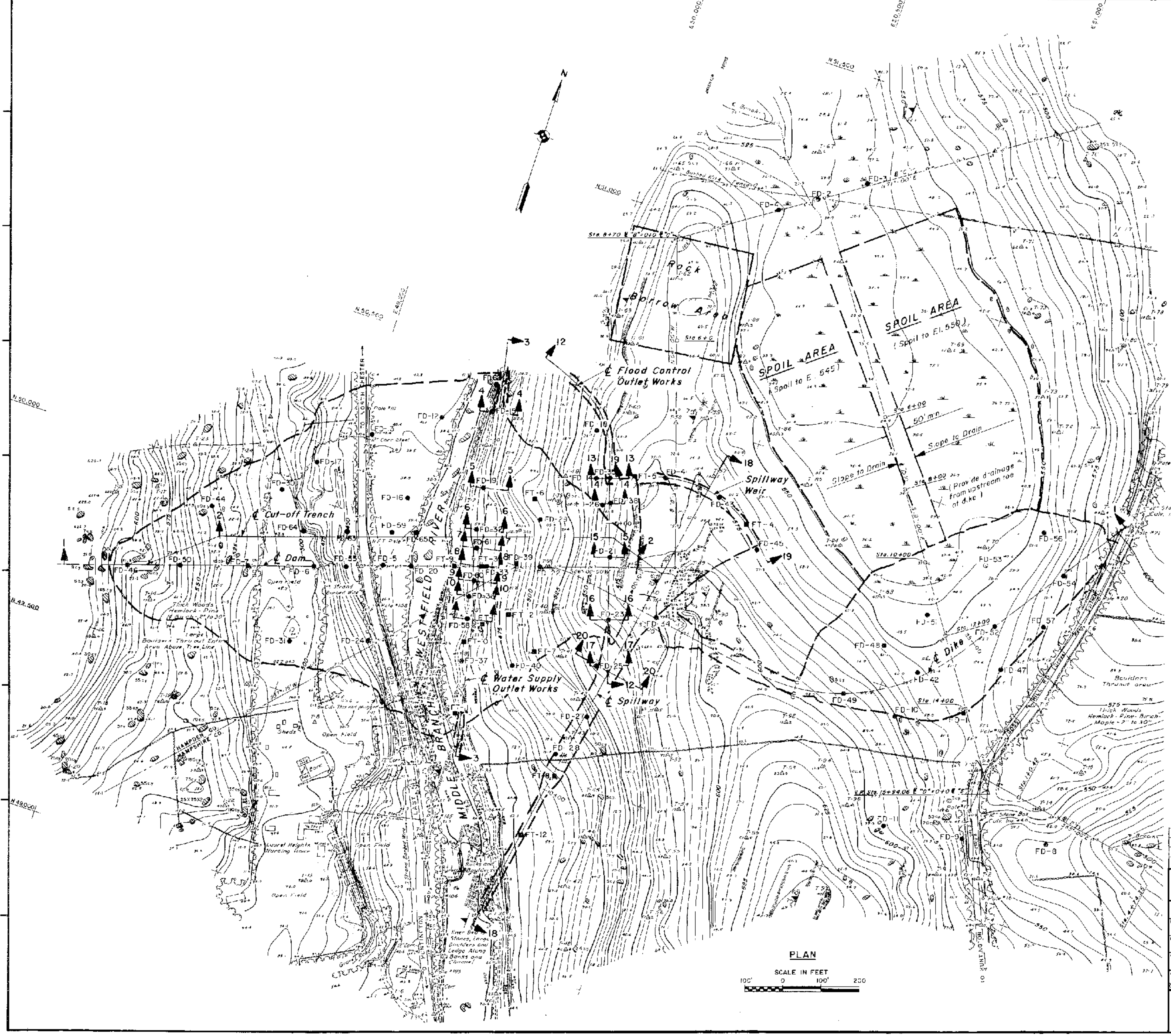
APPROVED John Wm. Leslie
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. [illegible]

DRAWING NUMBER
CT-2-1493
SHEET 9

CORPS OF ENGINEERS U. S. ARMY



LEGEND

- ● FD Foundation Test Boring
- ■ FT Foundation Test Pit
- ▥ Bedrock Outcrop
- ▨ Boulder or Rock Block
- ▼ 70° Strike and Dip of Foliation
- 3 ▲ ▲ 3 Location and Direction of View for Geologic and Geologic-Log Sections

NOTES

Elevations refer to Mean Sea Level Datum.
Contour interval equals 5 feet.

Origin of Coordinates is a local grid. County Bound of Hampden and Hampshire is N 50,000 – E 50,000

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES BY	DR BY	CK BY
P.A.V.	L.H.T.	R.C.K.

SUBMITTED: HEAD, GEOLOGY SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED: CHIEF, FDN. & MAT'LS BRANCH
APPROVAL RECOMMENDED: J. C. Dingwall CHIEF, PLANNING & R'PTS BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

PLAN OF FOUNDATION EXPLORATIONS

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

DATE MARCH 1962

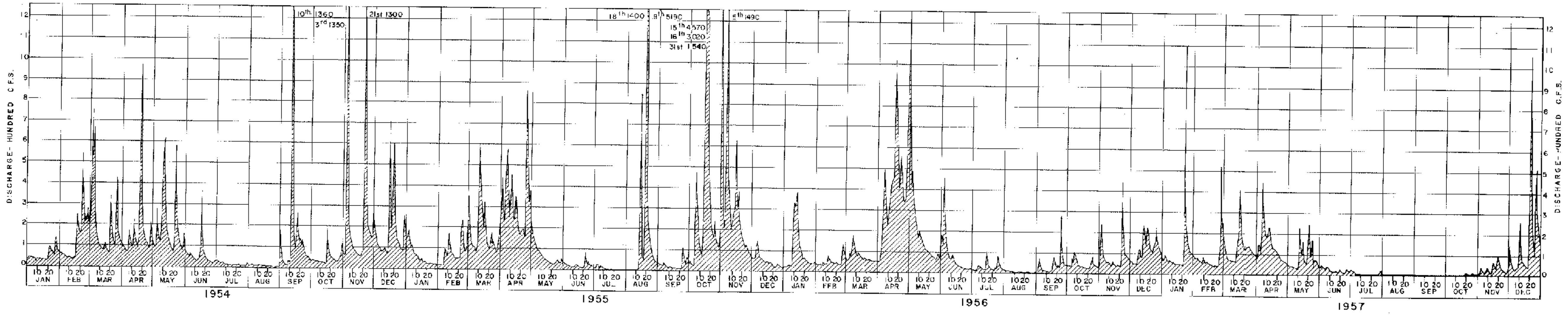
SCALE AS SHOWN | SPEC. NO.

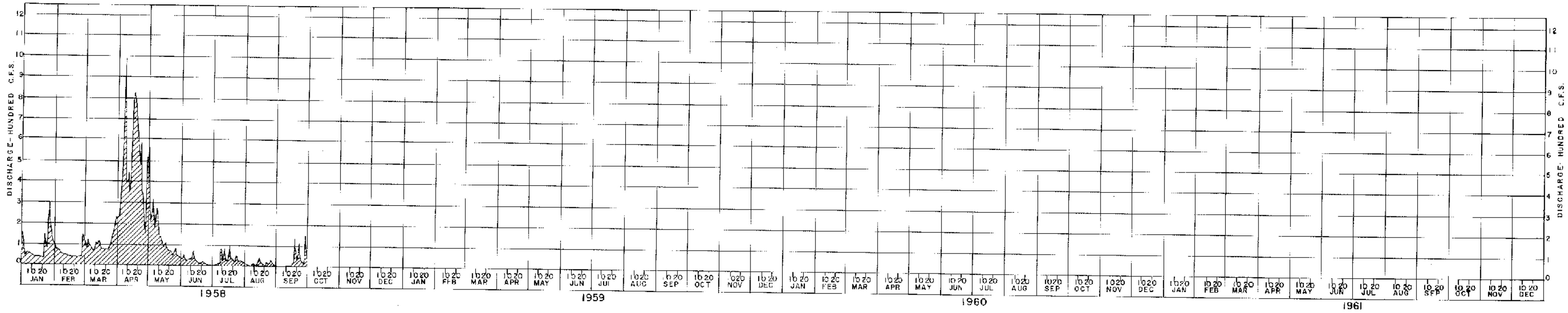
DRAWING NUMBER CT-2-1492

SHEET 8

CORPS OF ENGINEERS

U. S. ARMY



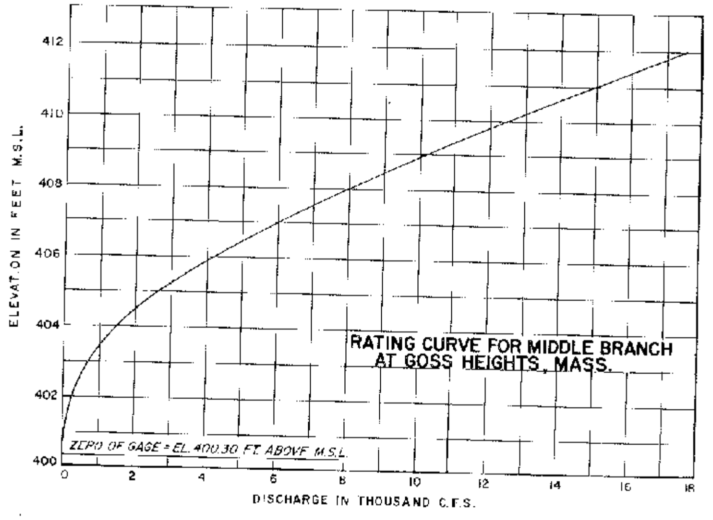


NOTES

1. These hydrographs are the daily average stream flow record of Middle Branch Westfield River, Goss Heights, Massachusetts from the tributary drainage area of 52.6 Square Miles.

2. Instantaneous peak discharges are shown where available.

3. The data contained herein are not intended as representations or warrantees but are furnished for information only. It is expressly understood that the government will not be responsible for any deductions, interpretations or conclusions therefrom made by any bidder or contractor.



REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY R.J.B
TR. BY
CK. BY F.R.S.
SUBMITTED E. F. Childs
CHIEF, HYD. & HYD. SECTION
PROJECT ENGINEER

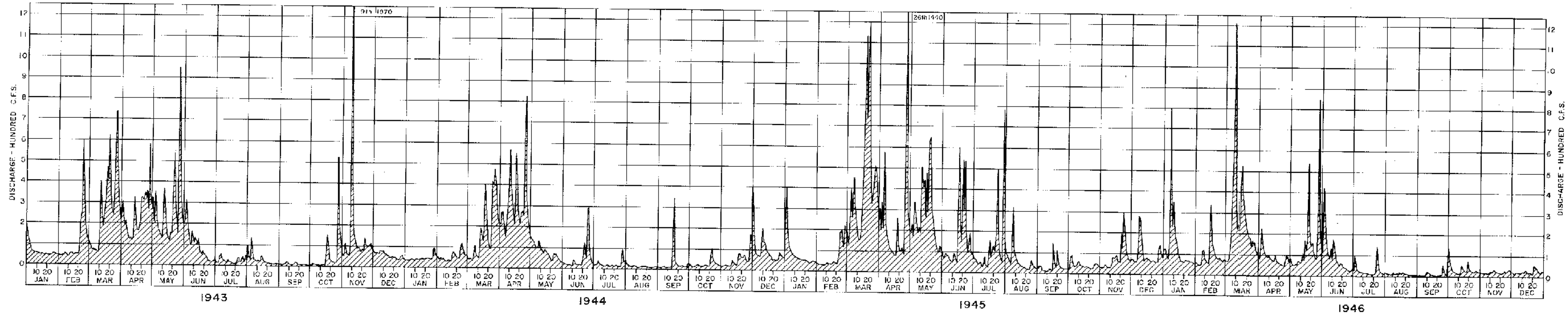
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE RESERVOIR
HYDROGRAPHS NO. 5
MIDDLE BRANCH WESTFIELD RIVER, MASS.

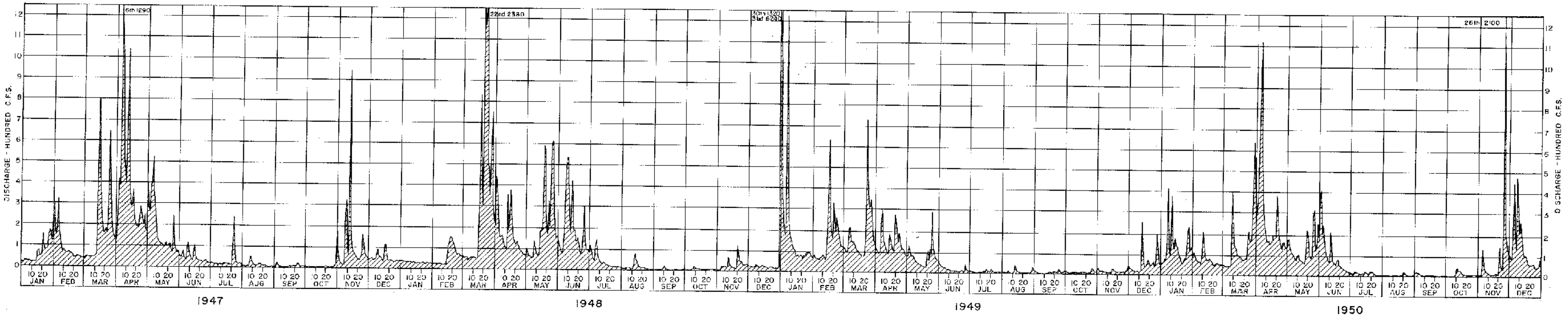
APPROVAL RECOMMENDED J. C. Dingwall
CHIEF, P. & R. BRANCH
APPROVED
CHIEF ENGINEERING DIVISION
DATE MAR 01 1962

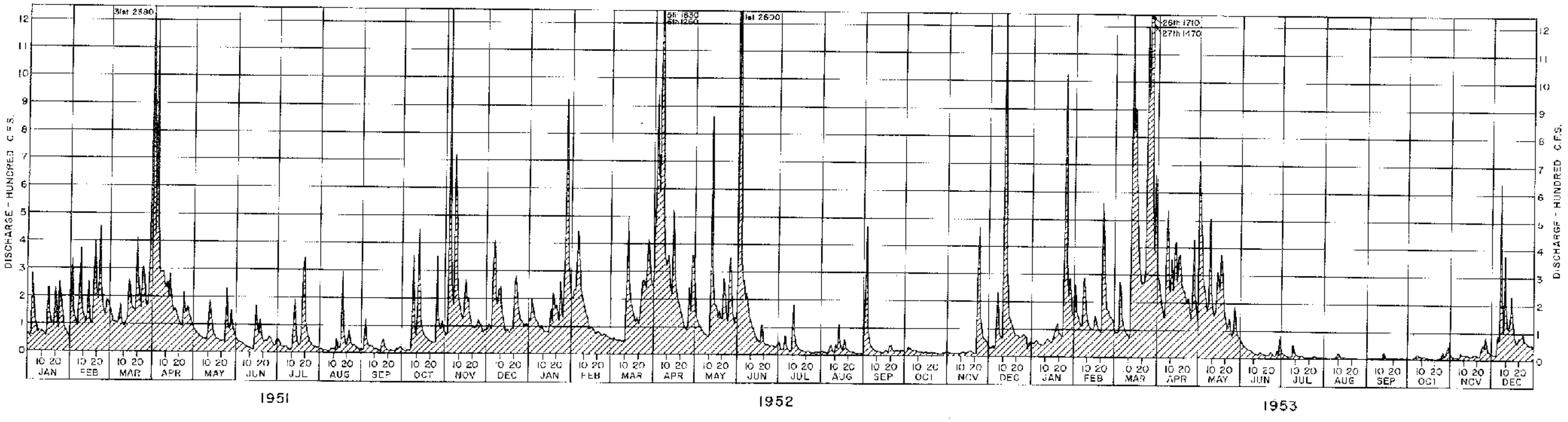
SCALE: AS SHOWN
SPEC. NO. CIV. ENG.-19-016-_ 99
DRAWING NUMBER
CT-1-5730
SHEET 7

CORPS OF ENGINEERS

U. S. ARMY







NOTES

1. These hydrographs are the daily average stream flow record of Middle Branch Westfield River, Goss Heights, Massachusetts from the tributary drainage area of 52.6 Square Miles.

2. Instantaneous peak discharges are shown where available.

3. The data contained herein are not intended as representations or warrantees but are furnished for information only. It is expressly understood that the government will not be responsible for any deductions, interpretations or conclusions therefrom made by any bidder or contractor.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY R.C.B. TR. BY CK. BY E.P.S.

SUBMITTED
E. T. Chiles
CHIEF, HYD. & HYD. SECTION

PROJECT ENGINEER
J. Hartley

APPROVAL RECOMMENDED
J. C. Dingwall
CHIEF P. & S. BRANCH

APPROVED
CHIEF ENGINEERING DIVISION

DATE

CONNECTICUT RIVER FLOOD CONTROL

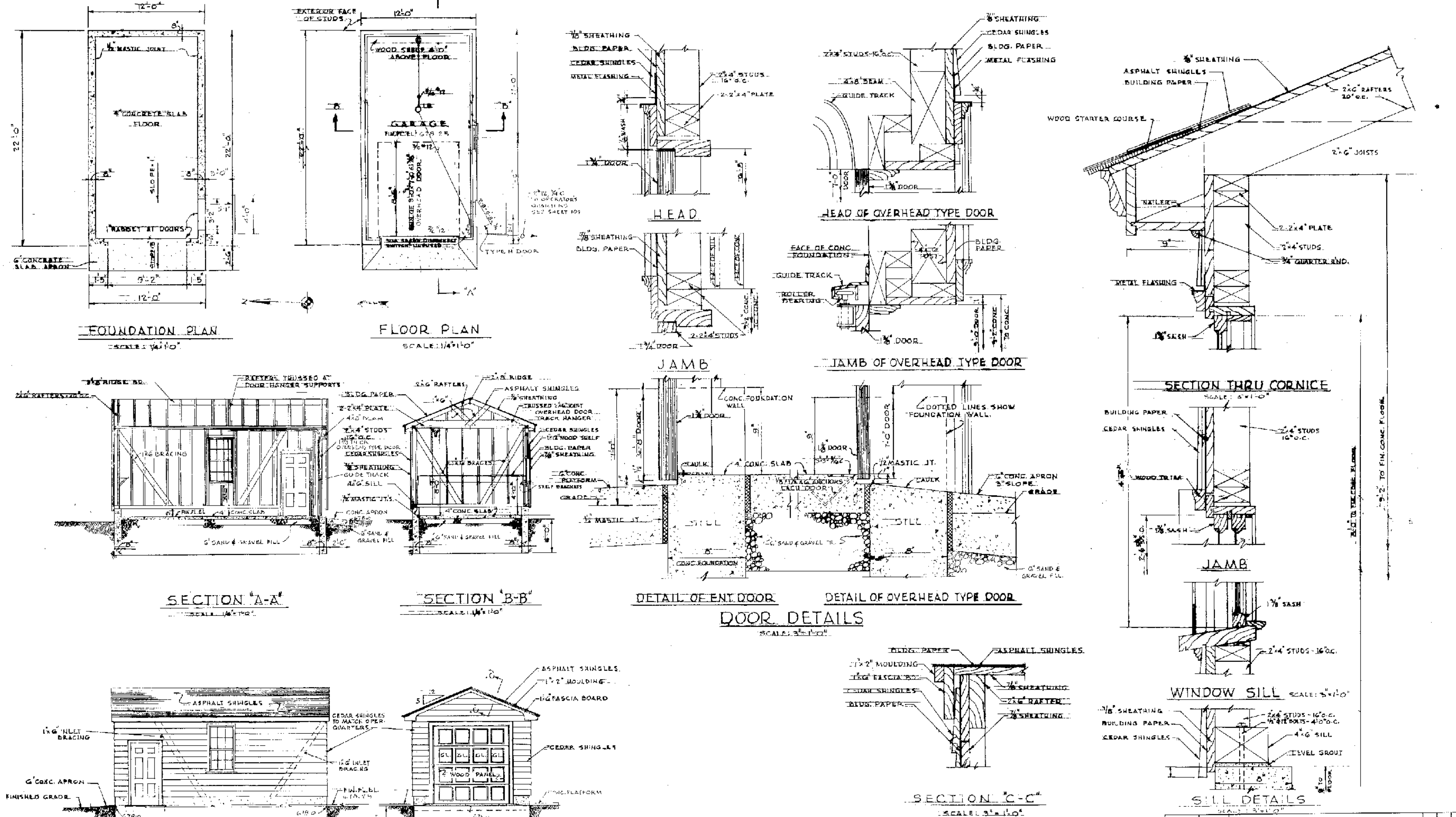
LITTLEVILLE RESERVOIR

HYDROGRAPHS NO. 4

MIDDLE BRANCH WESTFIELD RIVER, MASS.

SCALE: AS SHOWN
SPEC. NO. CIV ENG.-19-016-6?-49
DRAWING NUMBER
CT-1-5729
SHEET 6

CORPS OF ENGINEERS U. S. ARMY



ELECTRICAL SYMBOLS

○ — LIGHT

⊖ — DUPLEX RECEPTACLE

S — SWITCH

NOTES:

1. CEILING FIXTURE SHALL BE PORCELAIN SOCKET RECEPTACLE, KEYLESS WITH SHADE HOLDER GROOVE & 12" SHALLOW DOME REFLECTOR. MOUNT ON CEILING JOIST.
2. SWITCH & RECEPTACLE TO BE MOUNTED 48" ABOVE FLOOR.
3. ALL ITEMS ON THIS SHEET ARE TO BE PAID FOR UNDER ITEM NO. 9E

GRAPHIC SCALES

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

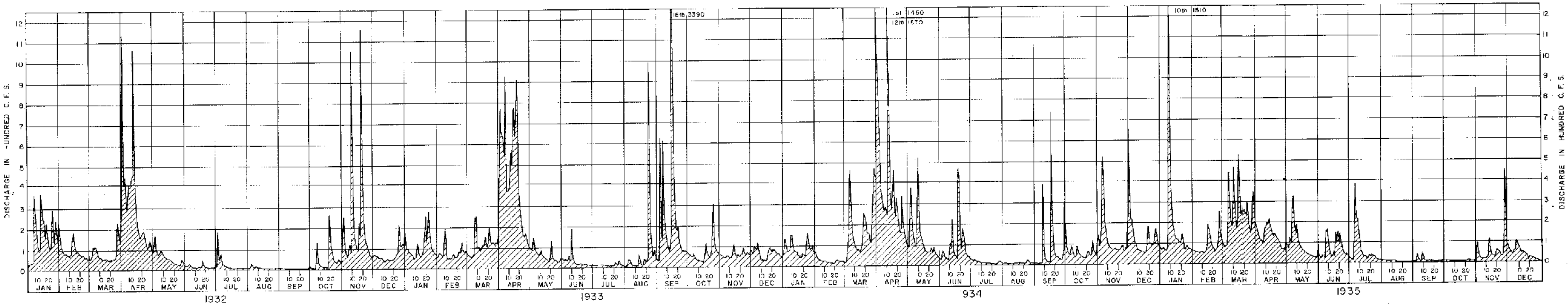
DES. BY J.S.	DR. BY C.M.A.	CK. BY J.J.

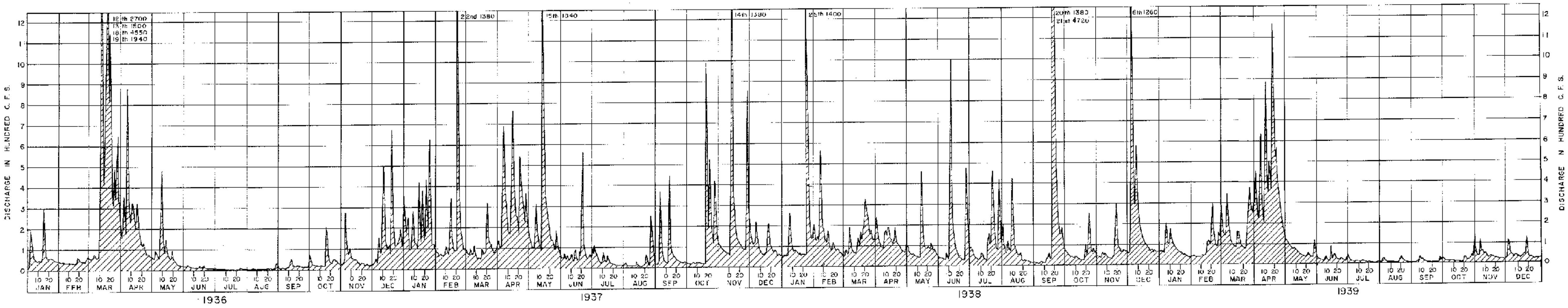
SUBMITTED: CHIEF, ARCH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED: CHIEF, F. & P. BRANCH

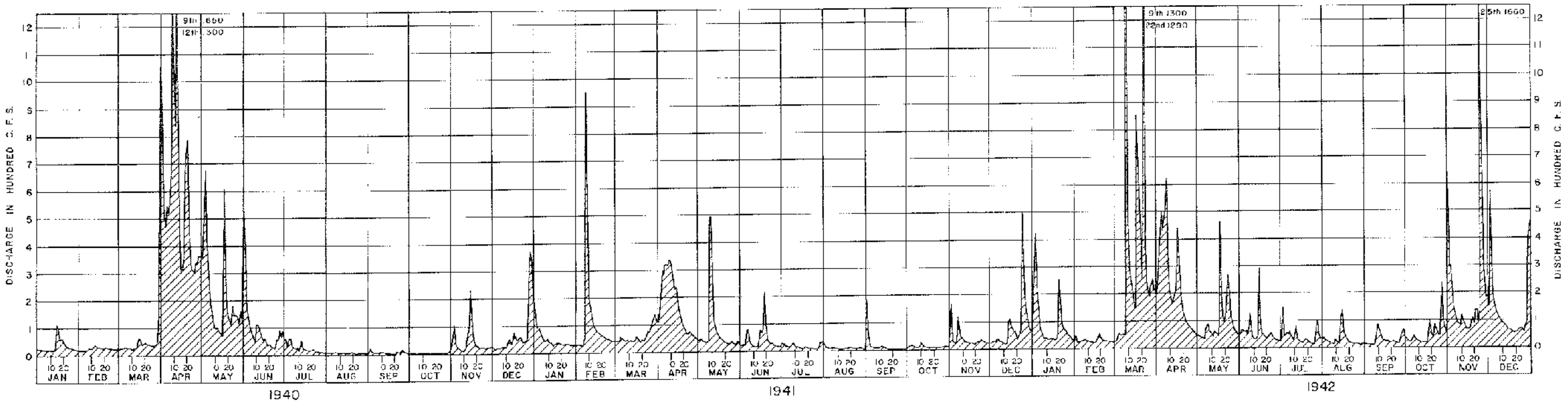
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GARAGE
PLANS, ELEVATIONS, SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED: CHIEF, ENGINEERING DIVISION
DATE: MARCH 1962

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 9-016-62-48
DRAWING NUMBER CT-1-5817
SHEET 111







NOTES

1. These hydrographs are the daily average stream flow record of Middle Branch Westfield River, Goss Heights, Massachusetts from the tributary drainage area of 52.6 Square Miles.

2. Instantaneous peak discharges are shown where available.

3. The data contained herein are not intended as representations or warrantees but are furnished for information only. It is expressly understood that the government will not be responsible for any deductions, interpretations or conclusions therefrom made by any bidder or contractor.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY R.J.B.	TR. BY	CK. BY E.P.S.

SUBMITTED E. F. Chiles
CHIEF, HYD. & HYD. SECTION

PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE RESERVOIR

HYDROGRAPHS NO. 3

MIDDLE BRANCH WESTFIELD RIVER, MASS.

APPROVAL RECOMMENDED C. Dougwall
CHIEF E. & H. BRANCH

APPROVED
CHIEF, ENGINEERING DIVISION

DATE

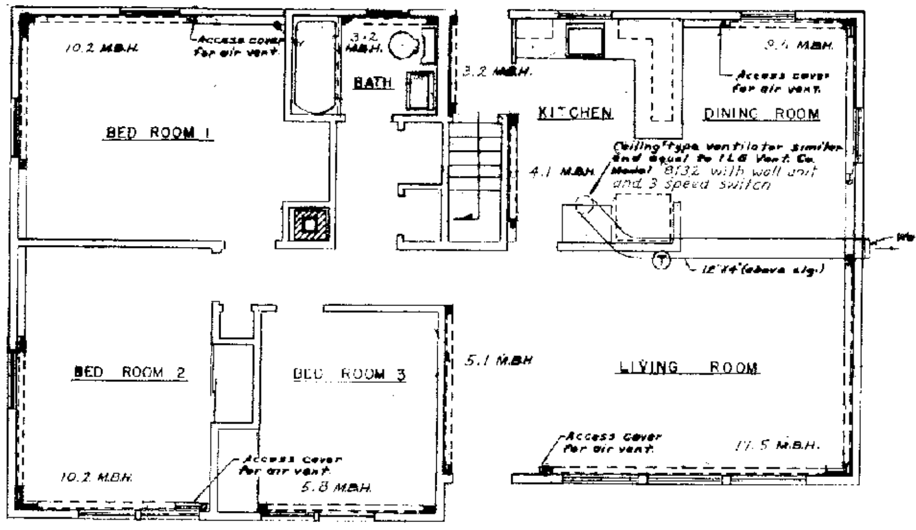
SCALE: AS SHOWN SPEC. NO CIV ENG.-9-016

DRAWING NUMBER
CT-1-5728

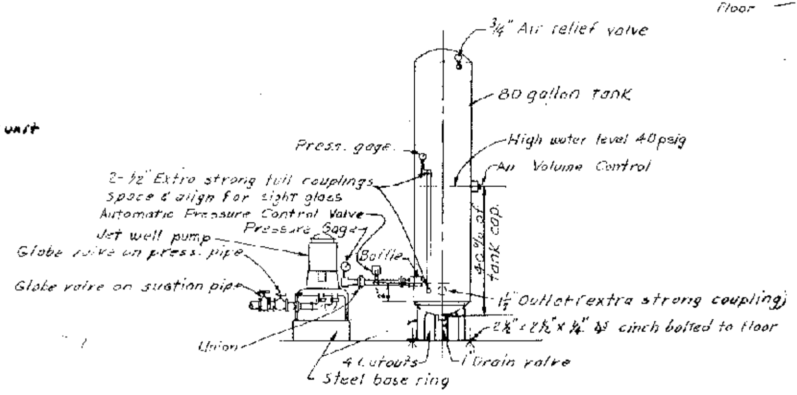
SHEET 5

CORPS OF ENGINEERS

U. S. ARMY

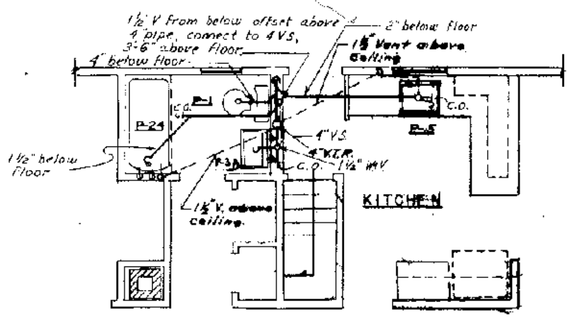

10.2 M.B.H.
Access cover for air vent.
3.2 M.B.H.
BATH
3.2 M.B.H.
KITCHEN
9.4 M.B.H.
Access cover for air vent.
DINING ROOM
BED ROOM 1
Ceiling type ventilator similar and equal to ILG Vent. Co. Model 8132 with wall unit and 3 speed switch
4.1 M.B.H.
Wall unit
12"x4" (above clg.)
BED ROOM 2
BED ROOM 3
5.1 M.B.H.
LIVING ROOM
Access cover for air vent.
11.5 M.B.H.
Access cover for air vent.
10.2 M.B.H.
5.8 M.B.H.

FIRST FLOOR PLAN — HEATING & VENTILATION


3/4" Air relief valve
80 gallon tank
Press. gage.
High water level 40 psig
Air Volume Control
2-1/2" Extra strong full couplings space & align for sight glass
Automatic Pressure Control Valve
Pressure Gage
Jet well pump
Baffle
Globe valve on press. pipe
Globe valve on suction pipe
40% of tank cap.
1 1/2" Outlet (extra strong coupling)
2 1/2" x 2 1/2" x 1/4" ∠s cinch bolted to floor
Union
4 Cutouts
1" Drain valve
Steel base ring

DETAIL- PNEUMATIC TANK

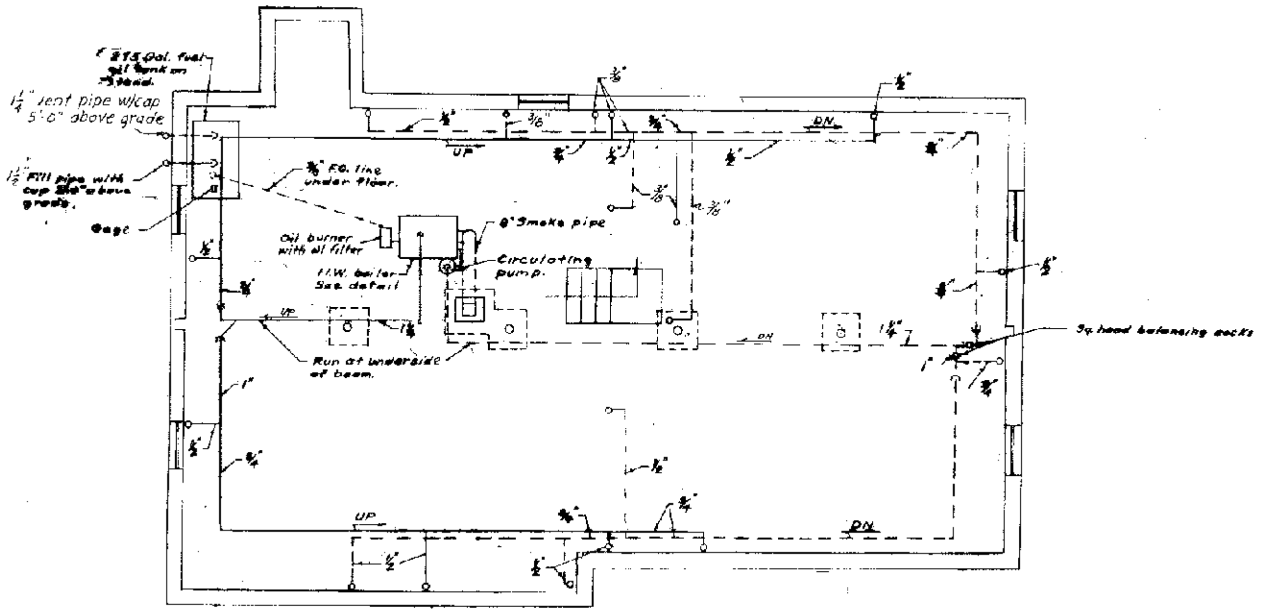
NOT TO SCALE



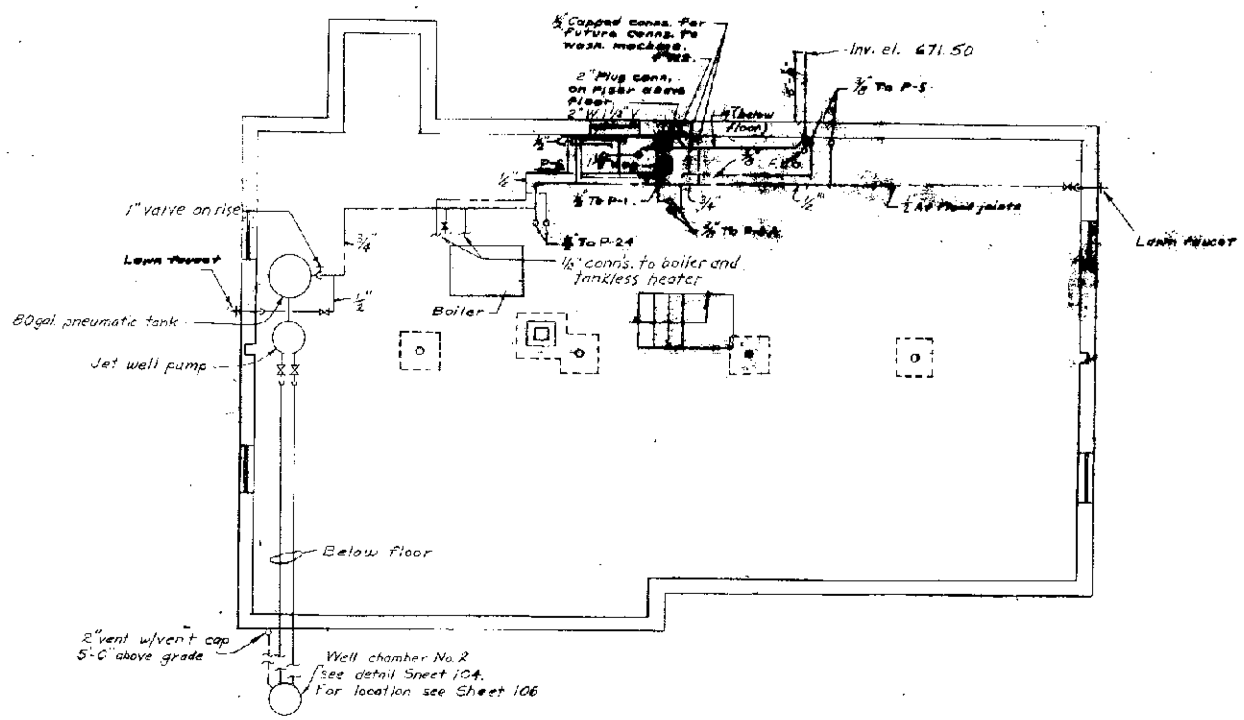
PART PLAN — PLUMBING

LEGEND

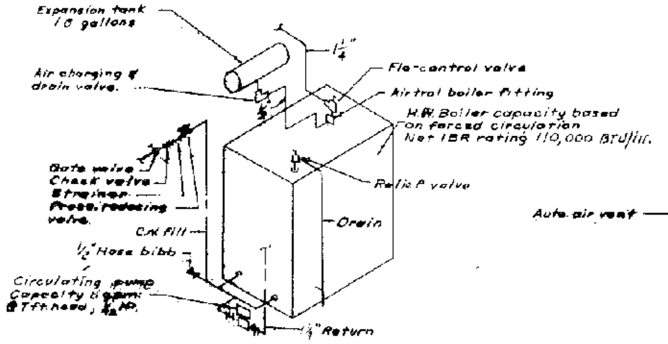
———	HEATING SUPPLY
— — —	HEATING RETURN
━━━	SOIL OR WASTE
- - - -	VENT
—·—·—	COLD WATER
—··—··—	HOT WATER
—⋈—	GATE VALVE
W&V.	WASTE & VENT
V.T.R.	VENT THRU ROOF
V	VENT


275 Gal. fuel oil tank on stand.
1 1/4" vent pipe w/cap 5'-0" above grade
1 1/2" Fill pipe with cap 3'-0" above grade.
Gage
3/8" F.O. line under floor.
Oil burner with oil filter
H.W. boiler See detail
8" Smoke pipe
Circulating pump.
Run at underside of beam.
UP
DN
1"
1 1/4"
Sq. head balancing cocks

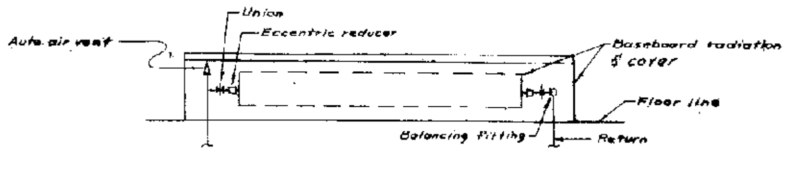
BASEMENT PLAN — HEATING


1/2" Capped conns. for future conns. to wash. machine.
2" Plug conn. on riser above floor
2" W 1 1/2" V
4" (below floor)
Inv. el. 671.50
3/8" To P-5
1/2" To P-1
3/4"
1/2"
1/2" At floor joists
3/8" To P-3
1/2" To P-24
1/2" conn's. to boiler and tankless heater
Boiler
1" valve on rise
Lawn faucet
80 gal. pneumatic tank
Jet well pump
Lawn faucet
Below floor
2" vent w/vent cap 5'-0" above grade
Well chamber No. 2 see detail Sheet 104. For location see Sheet 106

BASEMENT PLAN — PLUMBING


Expansion tank 18 gallons
1 1/4"
Air charging & drain valve.
Flo-control valve
Airtrol boiler fitting
H.W. Boiler capacity based on forced circulation Net IBR rating 110,000 BTU/Hr.
Gate valve
Check valve
Strainer
Press. reducing valve.
Relief valve
Drain
C.W. fill
1/2" Hose bibb
Circulating pump Capacity 8 gpm. @ 7 ft. head, 1/12 HP.
1 1/4" Return

DETAIL — BOILER CONNECTIONS



DETAIL — BASEBOARD RADIATION

NOTES

Piping in basement shall be run as high as possible to allow a maximum of headroom.

Baseboard radiation capacities based on 180°F average water temperature and 20°F temperature drop.

Provide continuous manual dampers for each section of radiation. Extend radiation covers wall to wall.

All work materials and equipment in connection with the heating, plumbing and ventilating, as specified, will be paid for under Item 97

All work, materials and equipment in connection with the exterior water system up to and including the well pump, as specified, will be paid for under Item 101.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.F.C.	DR. BY W.J.J.	CK. BY

SUBMITTED
CHIEF, MECH. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

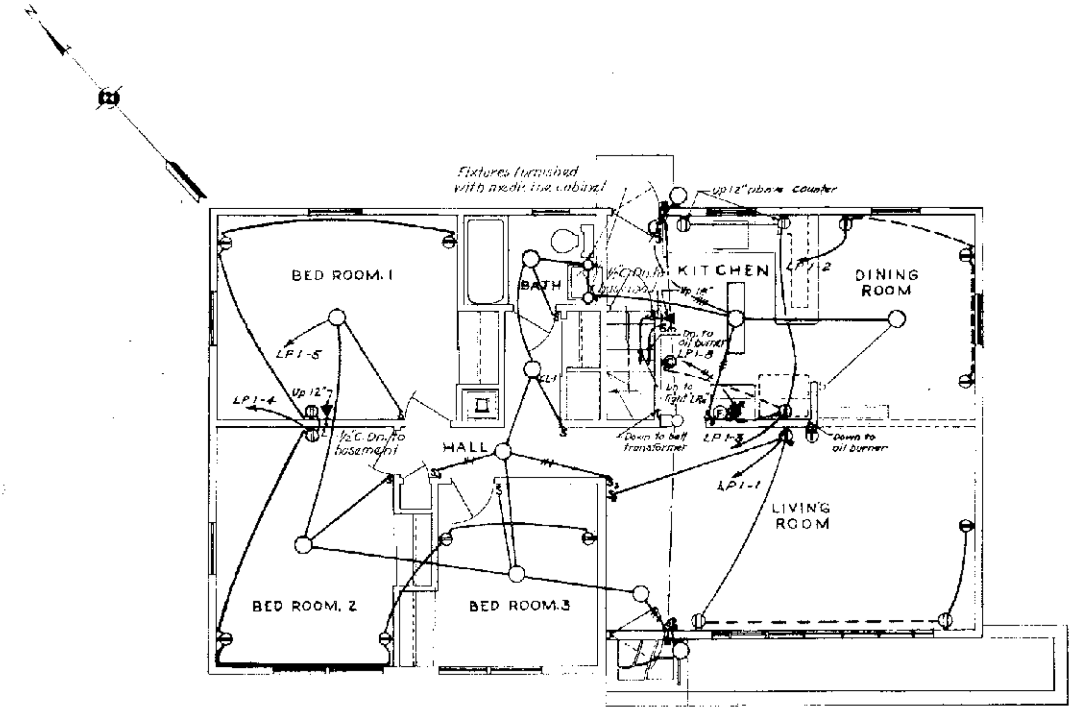
APPROVAL RECOMMENDED
CHIEF, E. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
OPERATORS QUARTERS
PLUMBING AND HEATING
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

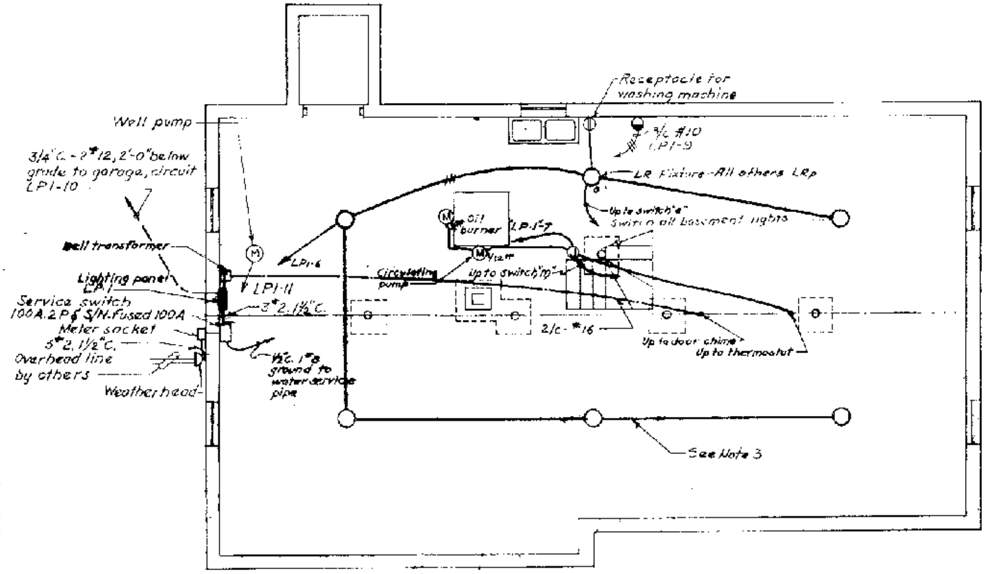
DATE MARCH 1962

8



FIRST FLOOR PLAN

SCALE 1/4"=1'-0"


Receptacle for washing machine
Well pump
3/c #10 LP1-9
3/4"C.-2#12, 2'-0" below grade to garage, circuit LP1-10
LR Fixture - All others LRp
Up to switch "a" Switch all basement lights
Oil burner
LP1-7
Bell transformer
LP1-6
Circulating pump
Up to switch "m"
Lighting panel LP1
LP1-11
Service switch 100A. 2P & S/N. Fused 100A
3#2, 1 1/2"C.
Meter socket
3#2, 1 1/2"C.
Overhead line by others
Weatherhead
1/2"C. 1#8 ground to water service pipe
2/c-#16
Up to door chime
Up to thermostat
See Note 3

BASEMENT FLOOR PLAN

SCALE 1/4"=1'-0"

LIGHTING FIXTURE SCHEDULE

LOCATION	C. OF E. TYPE	LAMP WATTAGE	MTG. HEIGHT	REMARKS
Living room	R-9	40		Ceiling mtg.
Bed room 1	R-12	2-40		Ceiling mtg.
Bed room 2	R-12	2-40		Ceiling mtg.
Bed room 3	R-12	2-40		Ceiling mtg.
Hall	R-10	2-60		Ceiling mtg.
	CL-1	2-60		Ceiling mtg.
Bath	R-9	40		Ceiling mtg.
Kitchen	F-7	2-40		Surface mtg.
Dining room	R-12	2-40		Ceiling mtg.
Basement	LR	60		Ceiling mtg.
	LRp	60		Ceiling mtg.
Exterior	R-5	60		Wall mtg.

LIGHTING PANEL LP 1

120/240V., S/N., 3 WIRE, 1ɸ
100 AMP MAINS

CIR. NO.	BRANCH BREAKER SIZE-AMPS	NO. POLES	SERVES	CONNECTED LOAD WATTS
1.	20	1	Receptacles Living room	750
2			Receptacles Dining room	1000
3.			Recept., fan & clock Kitchen	1200
4.			Receptacles Bed rooms	1200
5.			Lights First Floor	910
6.			Lights & Recept. Basement	860
7.			Oil burner & pump Basement	400
8.	50	2	Range Kitchen	11,000
9.	"	"	Clothes dryer Basement	8000
10.	20	1	Light & Recept. Garage	210
11.	20	2	Well pump	1000
Total connected load				26530

LEGEND

- Ceiling outlet and incandescent fixture.
- Wall outlet and incandescent fixture.
- Duplex convenience outlet. Mounting height 18" unless otherwise indicated.
- Range outlet, (50A. 250V. 3 wire).
- Clock outlet, mount 7'-0" up.
- Junction box.
- Fan outlet.
- Thermostat, mount 5'-0" up.
- Telephone outlet.
- S_a Single pole switch, up 3'-6", letter indicates fixture controlled.
- S_m Oil burner emergency switch.
- S_3 Three way switch.
- Fluorescent fixture and outlet.
- Lighting panel.
- Bell transformer.
- Push button.
- Door chime.
- Outlet for clothes dryer (50A. 250V. 3 Wire).
- Bell circuit concealed.
- Branch circuit, concealed in ceiling or wall.
- Branch circuit, concealed in floor.
- Home run to panel board. Number of arrows indicates number of circuits.

Note: Any circuit without further designation indicates a two wire #12 circuit. A greater number of #12 wires is indicated as follows: ‑///‑ (3 wires) ‑////‑ (4 wires), etc. 3/4"c. 3#10 indicates 3/4" rigid steel conduit containing 3#10 conductors.

NOTES

Ground neutral lighting conductor to the out going water line with #6 copper and suitable ground clamp.

Electrical work in the operators quarters will be paid for under Item 97

All wiring indicated on basement ceiling shall be run through joists to allow for future finishing of basement.

GRAPHIC SCALE
1/4"=1'-0" 4' 0 4' 8'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J A J | DR. BY B.T.N. | CK. BY [illegible]
SUBMITTED
CHIEF, ELECT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & N. BRANCH

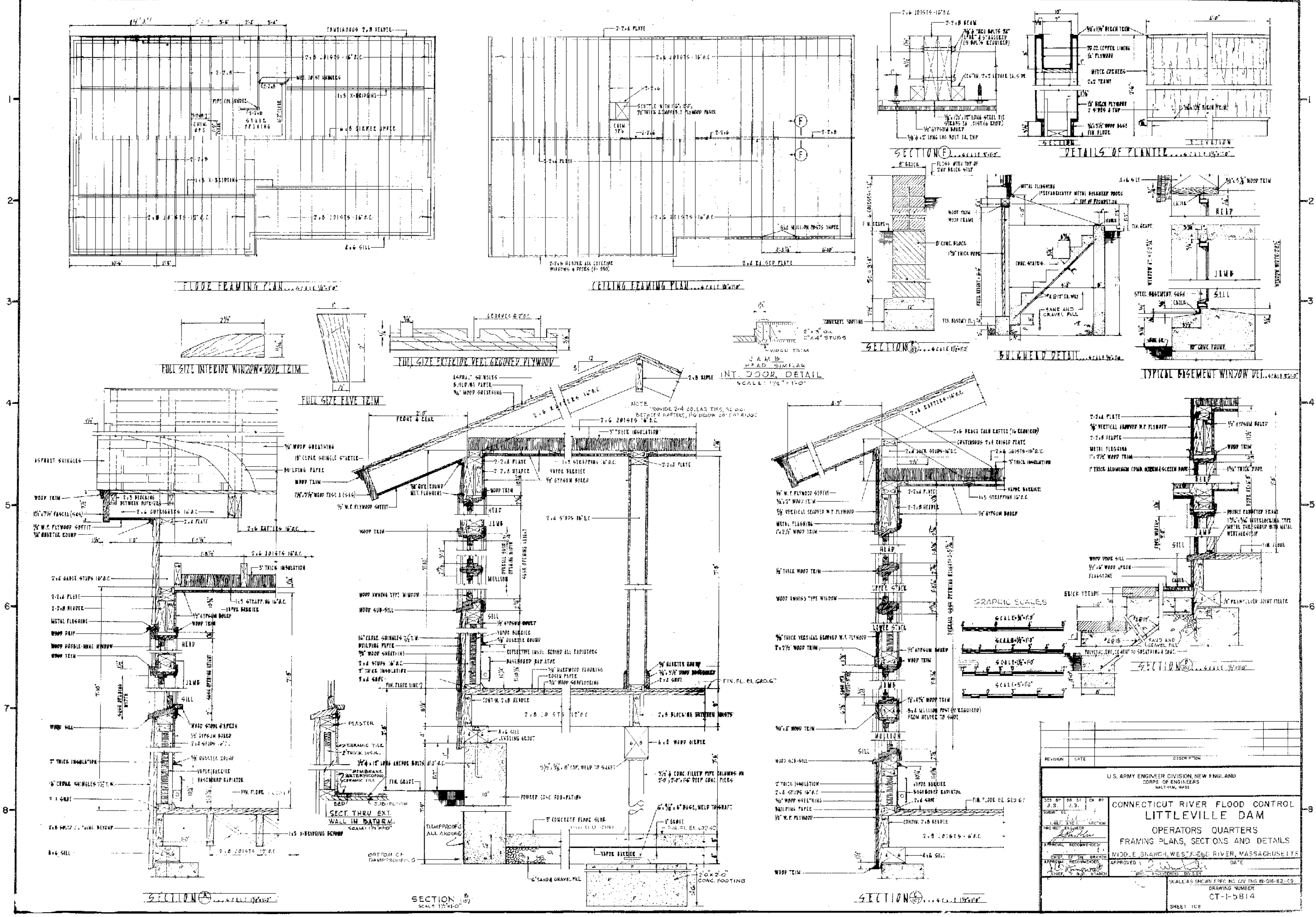
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
OPERATORS QUARTERS
ELECTRICAL PLAN
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE [illegible] 1962

SCALE: AS SHOWN | SPEC. NO. CIV. ENG.-19-016-62-49
DRAWING NUMBER
CT-1-5815
SHEET 109

CORPS OF ENGINEERS

U. S. ARMY



REVISION	DATE	DESCRIPTION

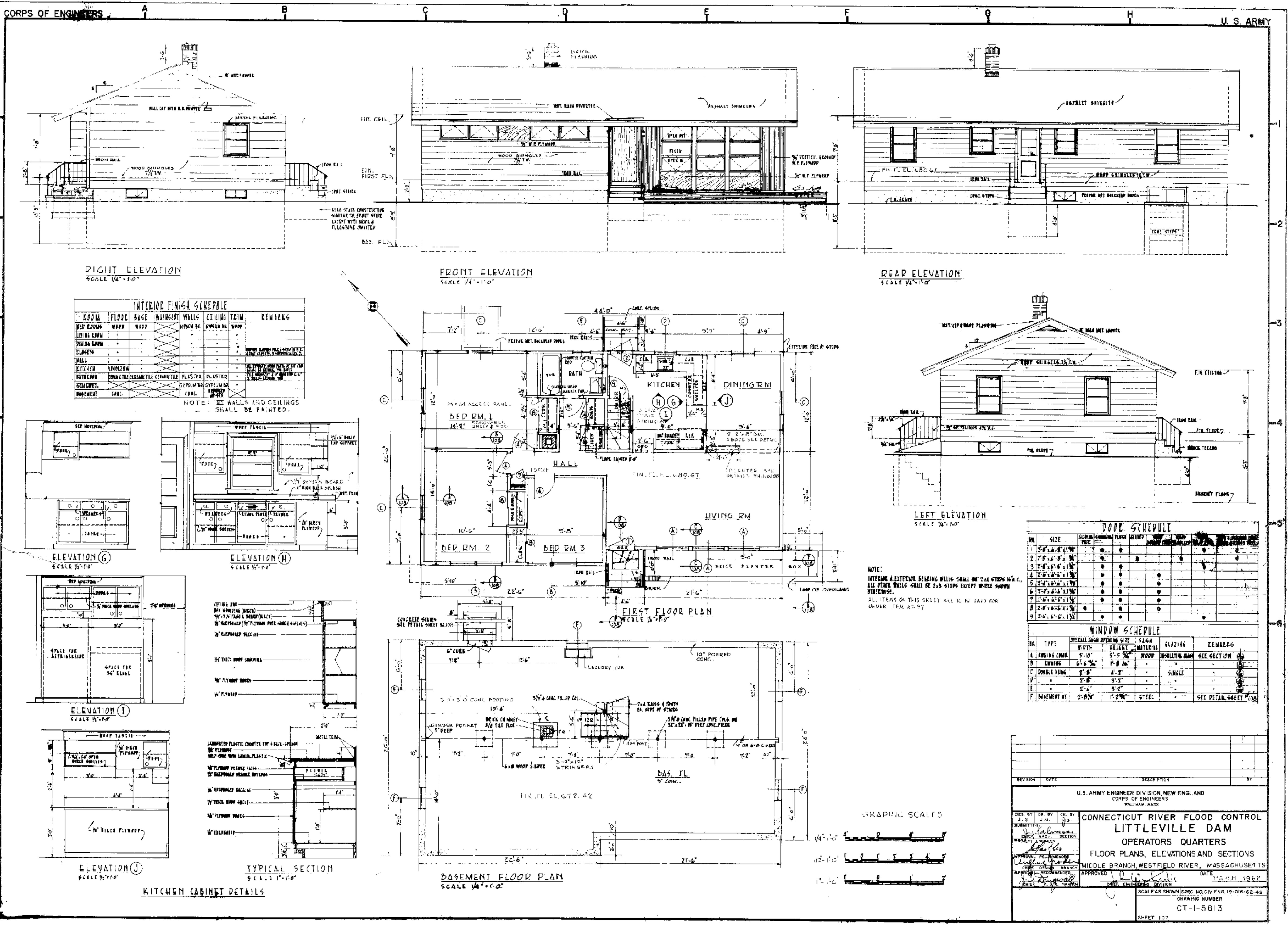
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY J.S. | DR. BY J.G. | CK. BY
SUBMITTED
CHIEF, ARCH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, F. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
OPERATORS QUARTERS
FRAMING PLANS, SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5814
SHEET 108



INTERIOR FINISH SCHEDULE

ROOM	FLOOR	BASE	WAINSCOT	WALLS	CEILING	TRIM	REMARKS
BED ROOMS	WOOD	WOOD		GYPSUM BD.	GYPSUM BD.	WOOD	
LIVING ROOM	"	"		"	"	"	
DINING ROOM	"	"		"	"	"	
CLOSETS	"	"		"	"	"	[illegible]
HALL	"	"		"	"	"	
KITCHEN	LINOLEUM	"		"	"	"	[illegible]
BATHROOM	CERAMIC TILE	CERAMIC TILE	CERAMIC TILE	PLASTER	PLASTER	"	TILE WAINSCOT 4'-0" [illegible]
STAIRWELL				GYPSUM BD.	GYPSUM BD.	"	
BASEMENT	CONC.			CONC.	[illegible]		

NOTE: III WALLS AND CEILINGS SHALL BE PAINTED.

NOTE:
INTERIOR & EXTERIOR BEARING WALLS SHALL BE 2x4 STUDS 16" O.C., ALL OTHER WALLS SHALL BE 2x3 STUDS EXCEPT WHERE SHOWN OTHERWISE.
ALL ITEMS ON THIS SHEET ARE TO BE PAID FOR UNDER ITEM NO. 97.

DOOR SCHEDULE

NO.	SIZE	SLIDING TYPE	SWINGING	FLUSH	GLAZED	[illegible]	[illegible]	[illegible]	[illegible]
1	3'-0" x 6'-8" x 1¾"		●	●				●	●
2	7'-8" x 6'-8" x 1¾"		●		●		●		●
3	2'-8" x 6'-6" x 1⅜"		●	●				●	
4	2'-6" x 6'-6" x 1⅜"		●	●		●			
5	2'-4" x 6'-6" x 1⅜"		●	●		●			
6	2'-0" x 6'-6" x 1⅜"		●	●		●			
7	1'-6" x 6'-6" x 1⅜"		●	●		●			
8	2'-0" x 6'-6" x 1⅜"	●		●		●			
9	2'-6" x 6'-6" x 1¾"		●	●				●	

WINDOW SCHEDULE

NO.	TYPE	OVERALL SASH OPENING SIZE		SASH MATERIAL	GLAZING	REMARKS
		WIDTH	HEIGHT			
A	AWNING COMB.	5'-10"	5'-5 ⅝"	WOOD	INSULATING GLASS	SEE SECTION
B	AWNING	6'-6 ⅝"	1'-8 ¼"	"	"	"
C	DOUBLE HUNG	2'-8"	4'-2"	"	SINGLE	"
D	"	2'-8"	3'-2"	"	"	"
E	"	2'-4"	3'-2"	"	"	"
F	BASEMENT UT.	2'-8½"	1'-2⅝"	STEEL	"	SEE DETAIL SHEET 108

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
J. S.	J. G.	J. S.

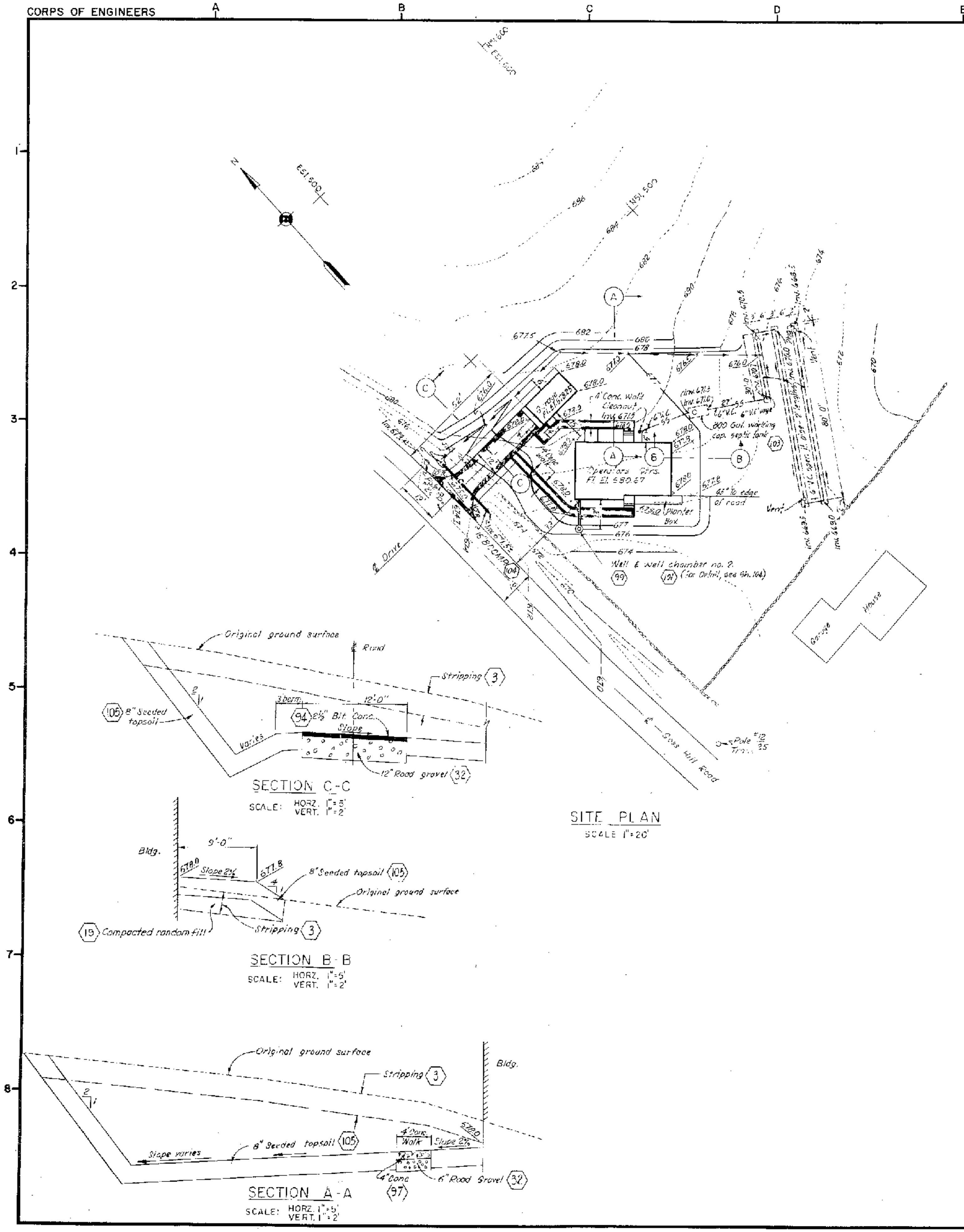
SUBMITTED J. Salomon
CHIEF, ARCH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED J. J. Dougherty
CHIEF, P. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
OPERATORS QUARTERS
FLOOR PLANS, ELEVATIONS AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5813
SHEET 107

CORPS OF ENGINEERS U. S. ARMY



SITE PLAN
SCALE 1"=20'

SECTION C-C
SCALE: HORZ. 1"=5' VERT. 1"=2'

SECTION B-B
SCALE: HORZ. 1"=5' VERT. 1"=2'

SECTION A-A
SCALE: HORZ. 1"=5' VERT. 1"=2'

NEW	EXISTING	LEGEND (THIS SHEET ONLY) DESCRIPTION
x677.0	x677.8	Elevations
—674—	···674···	Contours
▭		Paved Areas
	∞∞∞	Stone Wall
—C—		Culvert
→ →		Grade to drain
▭	▭	Buildings
	○	Utility pole
—W—		Water line
—SS—		Sanitary Sewer

NOTES

Existing contours shown on Goss Hill Road indicates finish grades after completion of road improvement.

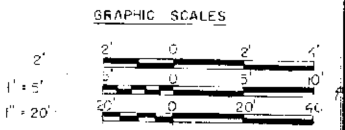
For details of concrete walk see Sheet 30

Figures in hexagons indicate item numbers under which payment will be made.

For cleanout and leaching trench system, see details sheet 99.

Location of septic tank to be determined in the field.

For septic tank material see specifications.



GRAPHIC SCALES

REVISION	DATE	DESCRIPTION	BY

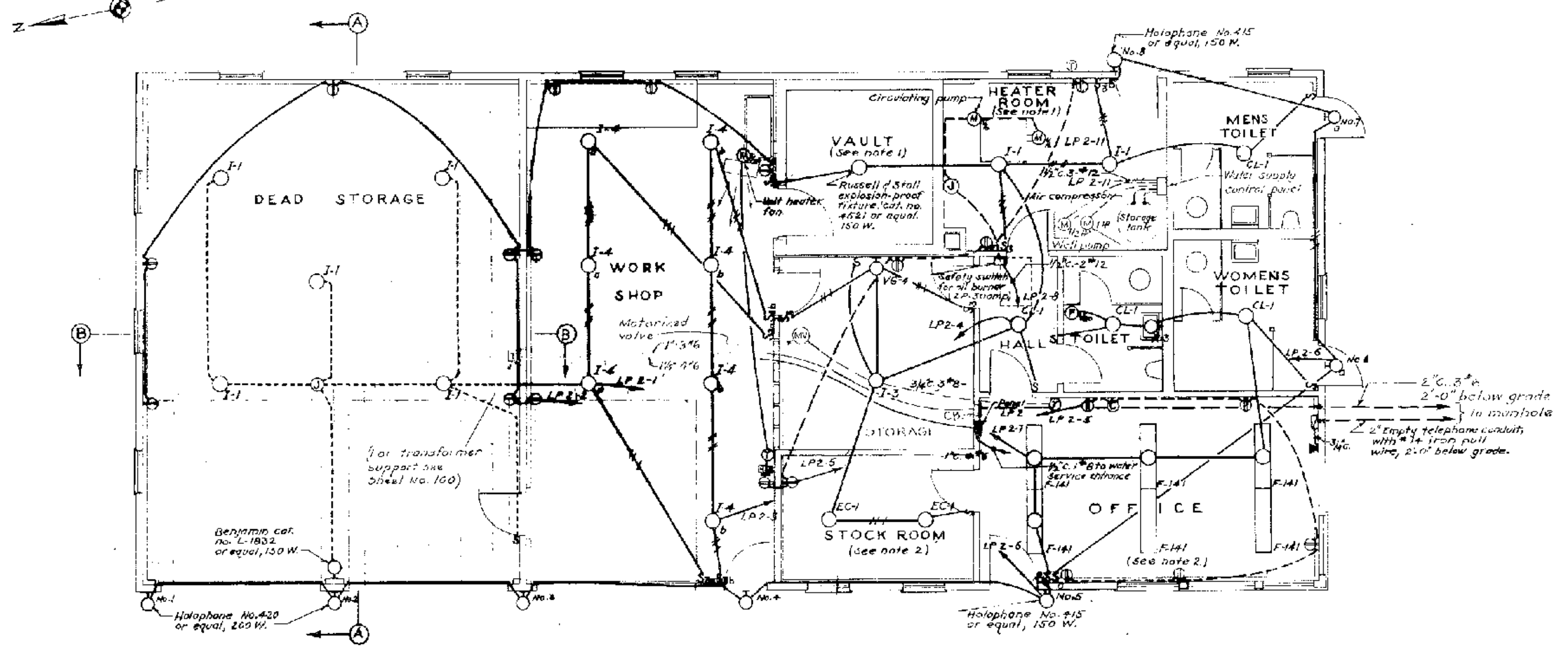
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H. McL.
DR. BY D.L.W.
CK. BY
SUBMITTED Herbert L. Hoy Jr. CHIEF, CIVIL SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED CHIEF, P.&S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
OPERATORS QUARTERS
SITE PLAN
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. ENG.-19-016-62-48
DRAWING NUMBER
CT-1-5812
SHEET 106


DEAD STORAGE
WORK SHOP
VAULT (See note 1)
HEATER ROOM (See note 1)
MENS TOILET
WOMENS TOILET
HALL
TOILET
STORAGE
STOCK ROOM (see note 2)
OFFICE (See note 2.)
I-1
I-4
I-3
VG-4
CL-1
EC-1
F-141
J
LP 2-1
LP 2-3
LP 2-4
LP 2-5
LP 2-6
LP 2-7
LP 2-8
LP 2-11
Panel LP2
CB
Holophane No.415 or equal, 150 W.
Holophane No.420 or equal, 200 W.
Benjamin cat. no. L-1832 or equal, 150 W.
(For transformer support see Sheet No. 160)
Motorized valve
1" 3#6
1¼" 4#6
Unit heater fan
Russell & Stoll explosion-proof fixture, cat. no. 4521 or equal. 150 W.
Circulating pump
Air compressor
Storage tank
Well pump
Water supply control panel
Safety switch for oil burner (2P-30amp.)
1½"c.3-#12
1½"c.-2#12
¾"c.3#8
1½"c.1#8 to water service entrance
2"c.3#6 2'-0" below grade to manhole
2" Empty telephone conduit, with #14 iron pull wire, 2'-0" below grade.
No.1
No.2
No.3
No.4
No.5
No.6
No.7
No.8
A
B

FLOOR PLAN
SCALE ¼"=1'-0"

NOTES:

All wiring in vault and heater room shall be insulated conductors in rigid steel conduit.
Mount receptacles 18" above floor in the office and stock room.

The electrical work in the utility building will be paid for under item 36.

LEGEND

- ○ Ceiling outlet and incandescent fixture
- ⊢○ Wall outlet and incandescent fixture
- ⊖ Duplex convenience outlet. Mounting height 4'-0" unless otherwise indicated.
- ⊢Ⓒ Clock outlet, up 7'-0"
- Ⓙ Junction box.
- ▶ Telephone outlet.
- S Single pole switch, up 4'-0"
- ▭ Fluorescent fixture and outlet.
- ■ Lighting panel.
- Ⓣ Transformer 15KVA 3φ, 480-208/120V., dry type. 2-5% taps below normal.
- CB 3P-600V 100 amp circuit breaker, 30 amp. trip.
- —T— Telephone conduit, concealed in floor.
- —— Branch circuit, concealed in ceiling or wall.
- — — Branch circuit, concealed in floor.
- —→ Home run to panel board. Number of arrows indicates number of circuits. Note: Any circuit without further designation indicates a two wire #12 circuit. A greater number of #12 wires is indicated as follows: —///— (3 wires) —////— (4 wires), etc. 3/4"c-3#10 indicates 3/4" rigid steel conduit containing 3#10 conductors.
- Sp Single pole switch with pilot light, up 4'-0"
- ⊠ Motor starter.
- ⊢Ⓣ Thermostat, up 5'-0".
- HOA Hand off Automatic selector switch, up 4'-0"
- Ⓕ Exhaust Fan.
- ▨ Telephone terminal cabinet 12"×16"×4"
- ☐ Safety switch.
- - - - - Branch circuit, run exposed.

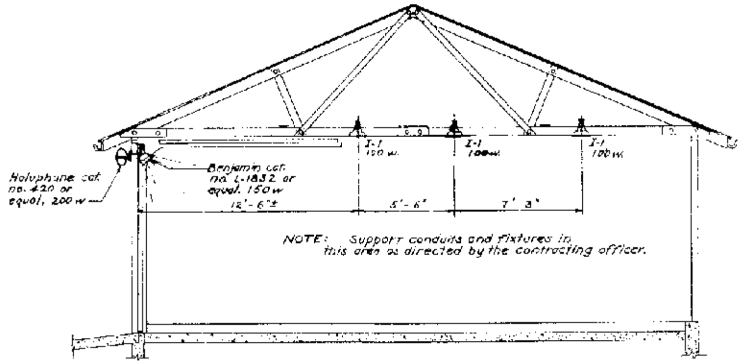
LIGHTING PANEL LP 2

120/208V., S/N., 4 WIRE, 3φ
100 AMP MAINS LUGS ONLY

CIR. NO.	BRANCH BREAKER SIZE-AMPS	NO. POLES	SERVES	CONNECTED LOAD WATTS
1	20	1	Lights-Dead storage and Work shop	1550
2			Receptacles Dead storage and Work shop	1500
3			Lights-Work shop	1200
4			Lights-Stock rm. storage, hall, toilet heater rm & vault	1140
5			Receptacles-Office, shop, stock heater & storage rms.	1500
6			Lights-Exterior	1500
7			Lights-Offices & toilets	900
8			Oil burner motor. Unit heater fan motor. ⅙ HP Circulating pump	600
9&10			Spares	
11		3	Well pump 1 HP [illegible]	[illegible]
Total connected load				11390

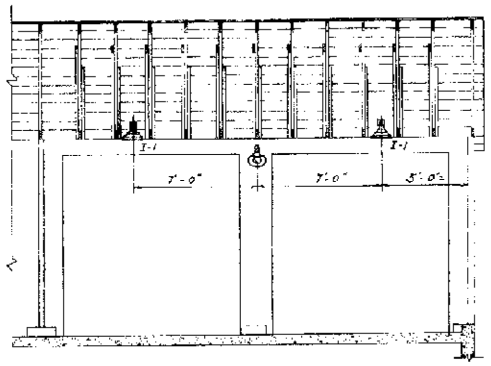
LIGHTING FIXTURE SCHEDULE

LOCATION	C. OF E. TYPE	LAMP WATTAGE	MTG. HEIGHT	REMARKS
Dead storage	I-1 Benj. #L1832 or equal	100 150	11'-0" 10'-0"	Between trusses On wall
Work shop	I-4	300	10'-6"	Ceiling mtg.
Stock room	EC-1	100	7'-3"	Ceiling mtg.
Storage	I-3 VG-4	200 150	7'-6" 7'-0"	Ceiling mtg. On wall
Vault	R.&S. cat. no. 4521 or equal	150	6'-6"	Ceiling mtg.
Heater room	I-1	100	7'-0"	Ceiling mtg.
Office	F-141	2-40	7'-6"	Surface mtg.
Toilet	CL-1 R-3	2-60 60	7'-9" 6'-3"	Ceiling mtg. On wall
Hall	CL1	2-60	7'-9"	Ceiling mtg.
Toilets (public)	CL-1	2-60	7'-9"	Ceiling mtg.
Exterior Nos. 1, 2, 3 & 4	Holophane #420 or equal	200	10'-0"	Wall mtg.
Exterior Nos. 6 & 7	Holophane #420 or equal	200	8'-0"	Wall mtg. over door
Exterior Nos. 5 & 8	Holophane #415 or equal	150	7'-0"	Wall mtg.


Holophane cat. no. 420 or equal, 200 w
Benjamin cat. no. L-1832 or equal, 150 w
I-1 100 w.
I-1 100 w.
I-1 100 w.
12'-6"±
5'-6"
7'-3"

NOTE: Support conduits and fixtures in this area as directed by the contracting officer.

SECTION "A-A"
SCALE 1/4"=1'-0"



SECTION "B-B"
SCALE 1/4"=1'-0"

GRAPHIC SCALE
1/4"=1'-0"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.A.C. DR. BY E.T.N. CK. BY J.R.
SUBMITTED Chief, Elect. Section
PROJECT ENGINEER
APPROVAL RECOMMENDED Chief, Design Branch
APPROVAL RECOMMENDED Chief, Branch

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
UTILITY BUILDING
ELECTRICAL
PLAN AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

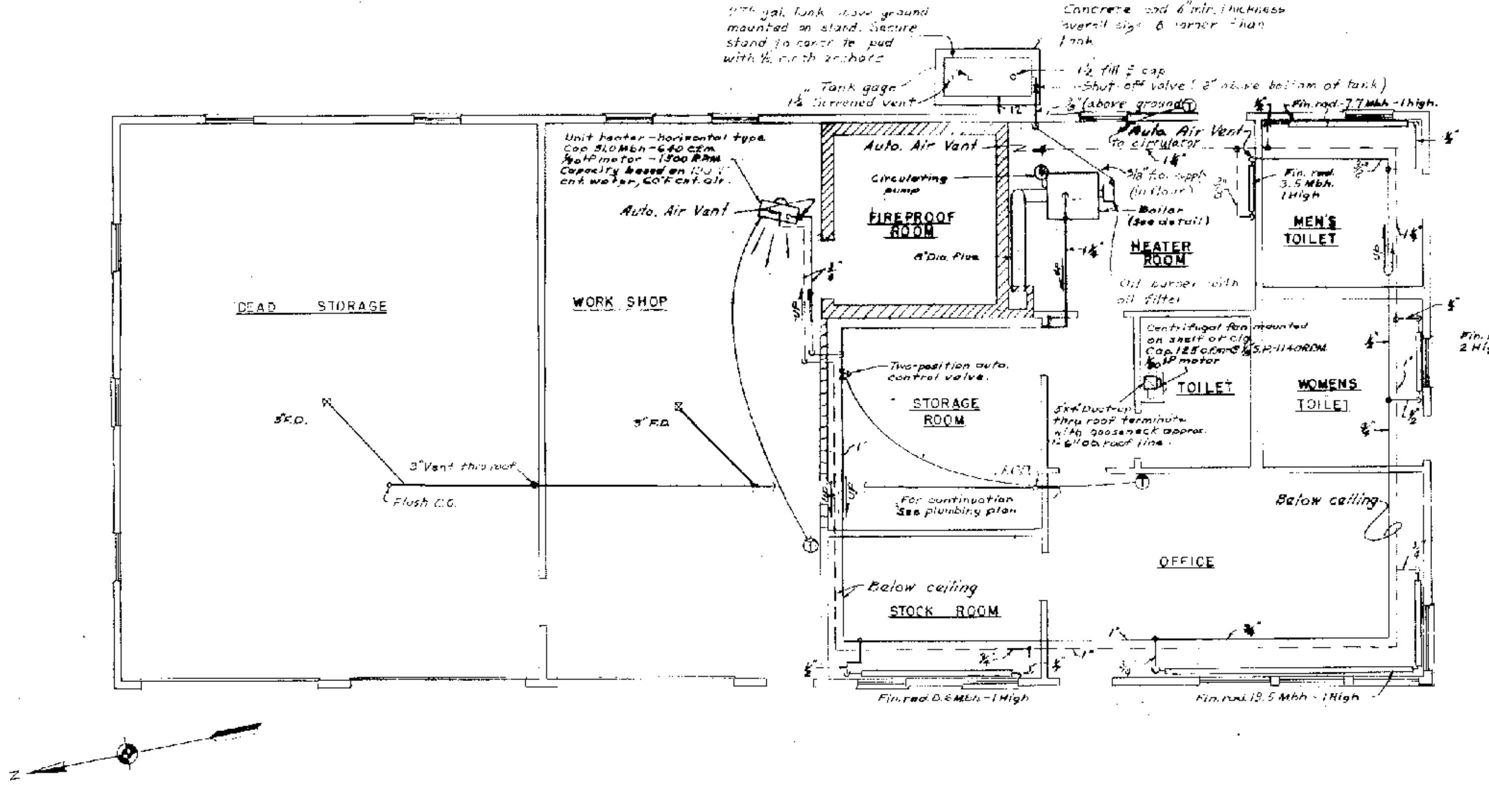
APPROVED Chief, Engineering Division
DATE MARCH, 1964

SCALE 1/4"=1'-0" SPEC. NO. ENG-19-016-62-49
DRAWING NUMBER
CT-1-58.11

SHEET 105

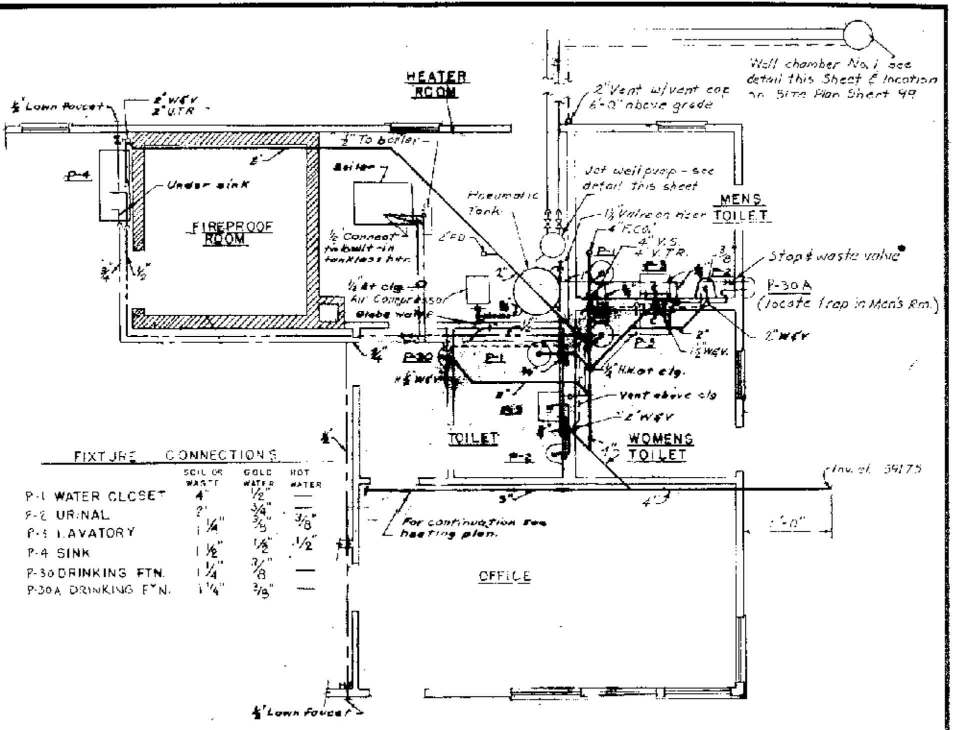
CORPS OF ENGINEERS

U. S. ARMY



275 gal. tank above ground mounted on stand. Secure stand to concrete pad with ½ inch anchors
Concrete pad 6" min. thickness overall size 6" larger than tank
1½ fill & cap
Shut off valve 2" above bottom of tank)
Tank gage
1¼ Screened vent
⅜"(above ground)
Auto. Air Vent
To circulator
Fin. rad. 7.7 Mbh - 1 high.
Unit heater - horizontal type Cap 51.0 Mbh - 640 cfm ⅙ HP motor - 1500 RPM Capacity based on 180°F ent. water, 60°F ent. air.
Auto. Air Vent
Circulating pump
FIREPROOF ROOM
8" Dia. Flue
⅜" fo. suppl. (in floor)
Boiler (see detail)
HEATER ROOM
Oil burner with oil filter
Fin. rad. 3.5 Mbh. 1 High
MEN'S TOILET
Fin. rad. 7.2 Mbh 2 High
Centrifugal fan mounted on shelf or clg. Cap. 125 cfm @ ⅛" S.P. 1140 RPM ⅟₂₀ HP motor
TOILET
WOMENS TOILET
5x4" Duct-up thru roof terminate with gooseneck approx. 1'-6" ab. roof line.
Two-position auto. control valve.
STORAGE ROOM
For continuation See plumbing plan
DEAD STORAGE
WORK SHOP
5" F.D.
3" F.D.
3" Vent thru roof
Flush C.O.
Below ceiling
OFFICE
Below ceiling
STOCK ROOM
Fin. rad. 0.6 Mbh - 1 High
Fin. rad. 19.5 Mbh - 1 High
N

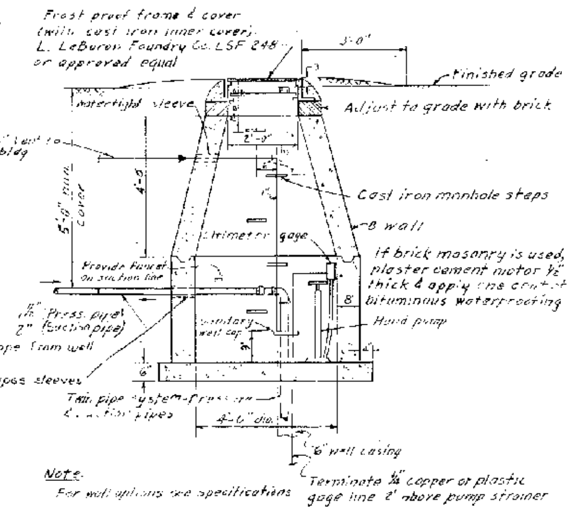
HEATING & VENTILATING PLAN
SCALE ¼" = 1'-0"



FIXTURE CONNECTIONS

	SOIL OR WASTE	COLD WATER	HOT WATER
P-1 WATER CLOSET	4"	½"	—
P-2 URINAL	2"	¾"	—
P-3 LAVATORY	1¼"	⅜"	⅜"
P-4 SINK	1½"	½"	½"
P-30 DRINKING FTN.	1¼"	⅜"	—
P-30A DRINKING FTN.	1¼"	⅜"	—

PLUMBING PLAN
SCALE ¼" = 1'-0"



Frost proof frame & cover (with cast iron inner cover) L. LeBaron Foundry Co. LSF 248 or approved equal
3'-0"
Finished grade
Watertight sleeve
Adjust to grade with brick
2'-0"
Vent to bldg
4'-0"
5'-0" min. cover
Cast iron manhole steps
8" wall
Altimeter gage
If brick masonry is used, plaster cement mortar ½" thick & apply one coat of bituminous waterproofing
Provide faucet on suction line
1¼" Press. pipe
2" (Suction pipe)
Maintain positive slope from well to pump
Watertight pipes sleeves
Sanitary well cap
Hand pump
8"
6"
Twin pipe system - Pressure & suction pipes
4'-6" dia.
6" well casing
Terminate ¼" copper or plastic gage line 2' above pump strainer

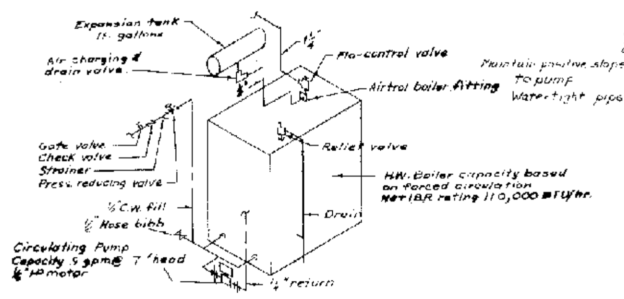
Note.
For well options see specifications

TYPICAL ... WELL CHAMBER
NOT TO SCALE

NOTE

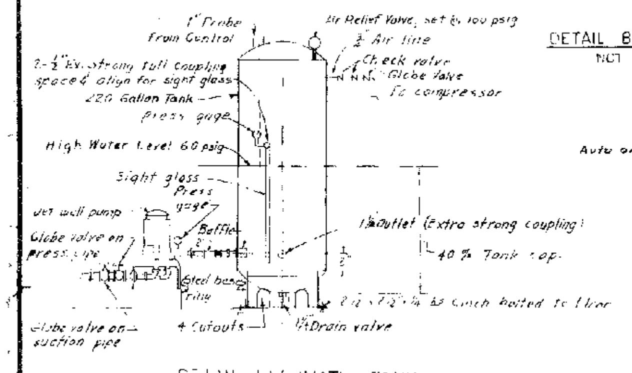
All work materials and equipment in connection with the plumbing, heating and ventilation, as specified, will be paid for under Item 96.

All work, materials and equipment in connection with the exterior water distribution system up to and including the well pump, as specified, will be paid for under Item 100.



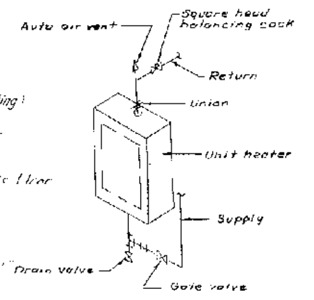
Expansion tank 15 gallons
Air charging & drain valve
1¼"
Flo-control valve
Airtrol boiler fitting
Gate valve
Check valve
Strainer
Press. reducing valve
Relief valve
H.W. Boiler capacity based on forced circulation Net IBR rating 110,000 BTU/hr.
½" C.W. fill
½" Hose bibb
Drain
Circulating Pump Capacity 5 gpm @ 7' head ⅙" HP motor
1¼" return

DETAIL BOILER CONNECTIONS
NOT TO SCALE

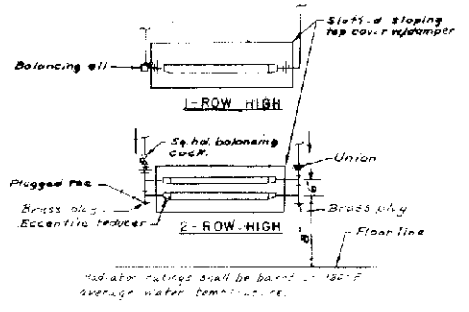


1" Probe from Control
Air Relief Valve, set @ 100 psig
½" Air line
Check valve
Globe Valve
To compressor
2-½" Ex. strong full coupling spaced & align for sight glass
220 Gallon Tank
Press gage
High Water Level 60 psig
Sight glass
Press gage
Jet well pump
Baffle
Globe valve on press. pipe
Steel base ring
1½" outlet (Extra strong coupling)
40% Tank cap.
2½ x 2½ x ¼ ∠s 4 each bolted to floor
4 Cutouts
1¼" Drain valve
Globe valve on suction pipe

DETAIL - PNEUMATIC TANK
NOT TO SCALE



DETAIL UNIT HEATER
NOT TO SCALE



Radiator ratings shall be based on 180°F average water temperature.

DETAIL-WALL FIN RADIATORS
NOT TO SCALE

LEGEND

———	HEATING SUPPLY
— — —	HEATING RETURN
━━━	SOIL OR WASTE
— - —	COLD WATER
— -- —	HOT WATER
- - - -	VENT
⋈	GATE VALVE
V.T.R.	VENT THRU ROOF
F.C.O.	FLUSH CLEAN OUT

GRAPHIC SCALE
SCALE ¼" = 1'-0"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

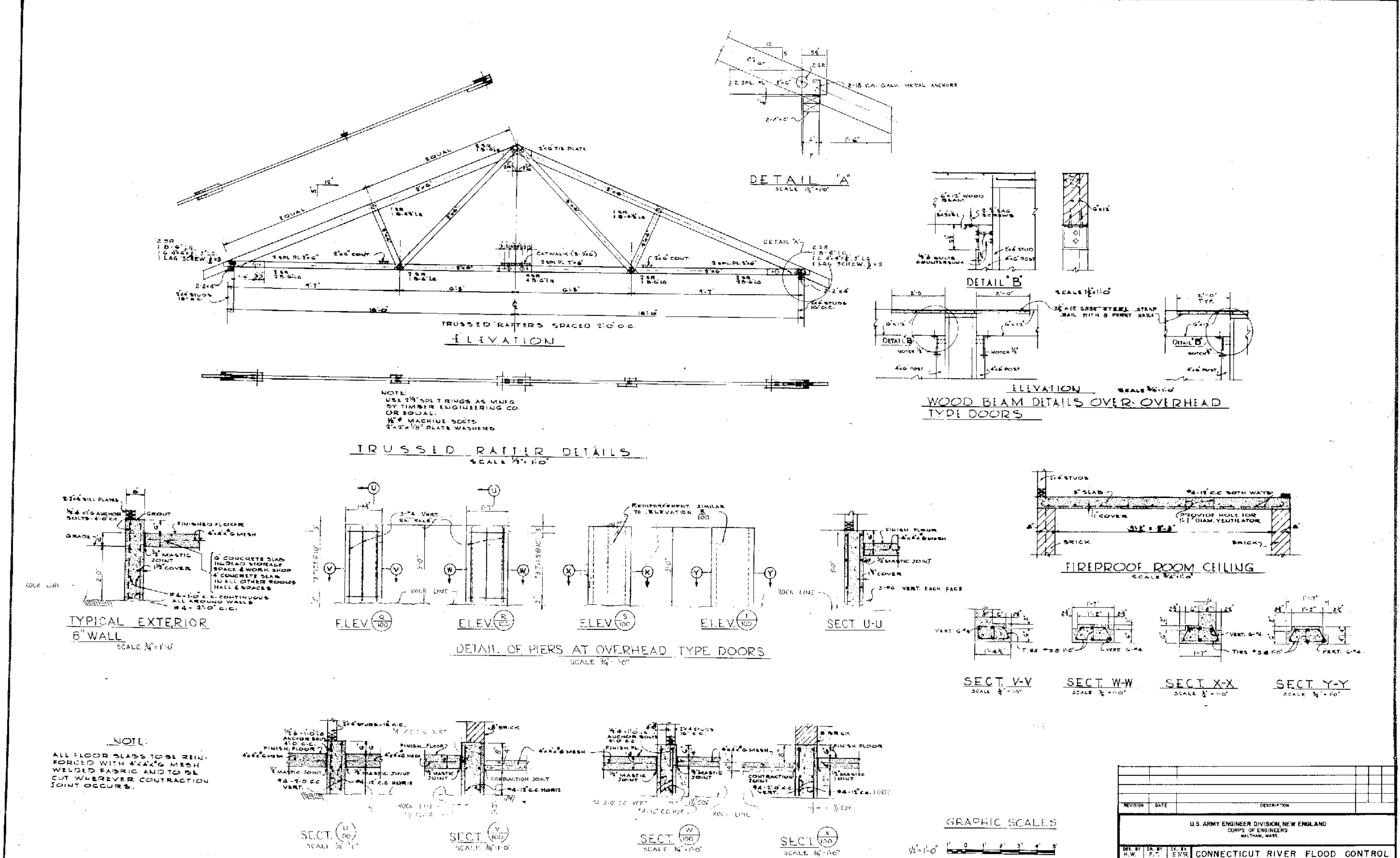
DES. BY J.F.C. | DR. BY W.J.J. | CK. BY [illegible]
SUBMITTED
CHIEF, MECH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
UTILITY BUILDING
PLUMBING AND HEATING
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE [illegible]

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 9-016-62-4
DRAWING NUMBER
CT-1-5810
SHEET 104

CORPS OF ENGINEERS U.S. ARMY



NOTE:
USE 2½" SPLIT RINGS AS MNFG BY TIMBER ENGINEERING CO. OR EQUAL.
⅝" Ø MACHINE BOLTS
2"x2"x⅛" PLATE WASHERS

NOTE:
ALL FLOOR SLABS TO BE REINFORCED WITH 4x4x6 MESH WELDED FABRIC AND TO BE CUT WHEREVER CONTRACTION JOINT OCCURS.

GRAPHIC SCALES

½"=1'-0" 1' 0 1' 2' 3' 4' 5'

¾"=1'-0" 1' 0 1' 2' 3'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H.W.	F.T.	ERR

SUBMITTED
CHIEF, STRUCT. SECTION

PROJECT ENGINEER

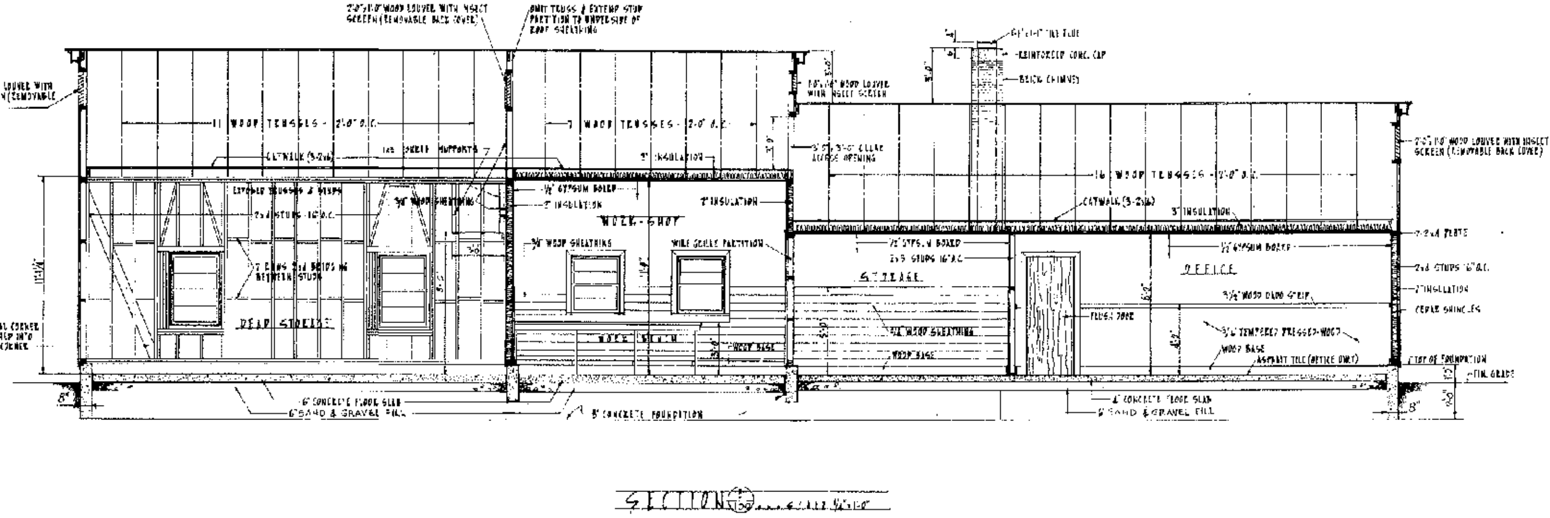
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, P. & A. BRANCH

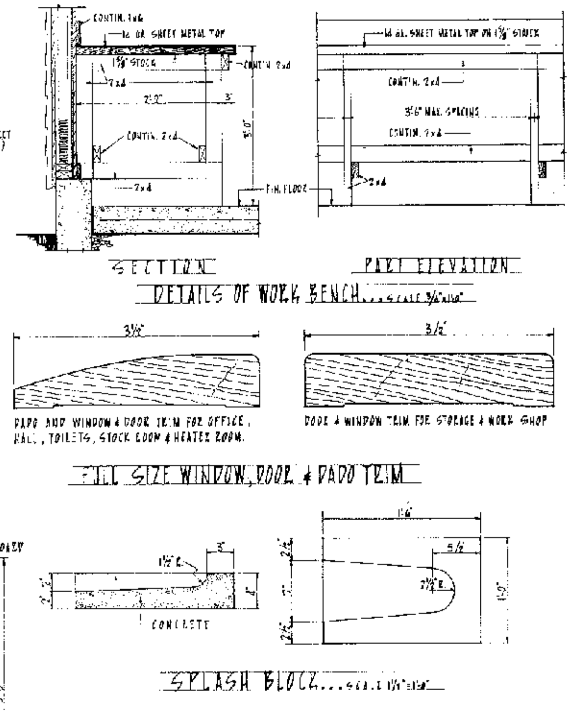
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
UTILITY BUILDING
STRUCTURAL DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5809
SHEET 103



SECTION ...SCALE 1/4"=1'-0"


CONTIN. 2x6
16 GA. SHEET METAL TOP
1 3/8" STOCK
CONTIN. 2x4
2x4
FIN. FLOOR
3'-0" MAX. SPACING
DADO AND WINDOW & DOOR TRIM FOR OFFICE, HALL, TOILETS, STOCK ROOM & HEATER ROOM.
DOOR & WINDOW TRIM FOR STORAGE & WORK SHOP
CONCRETE

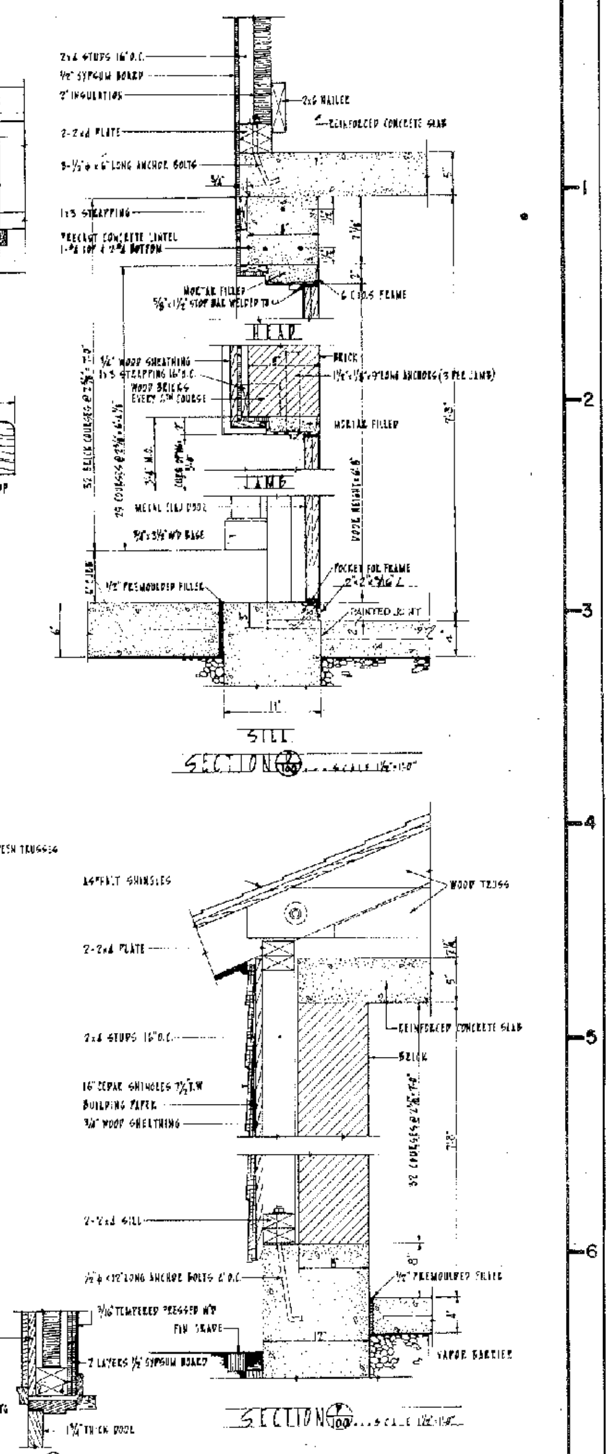
SECTION

PART ELEVATION

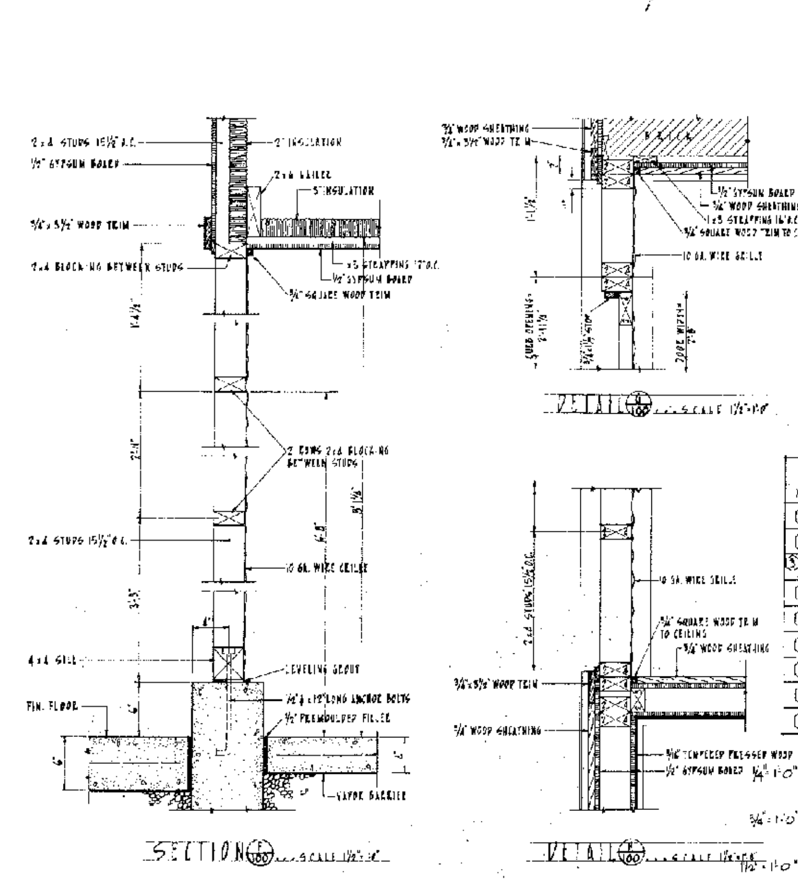
DETAILS OF WORK BENCH...SCALE 3/4"=1'-0"

FULL SIZE WINDOW, DOOR & DADO TRIM

SPLASH BLOCK...SCALE 1 1/2"=1'-0"

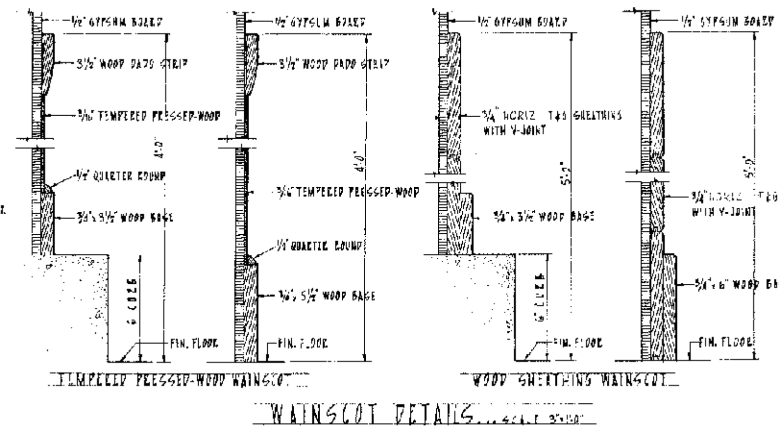


SECTION ...SCALE 1 1/2"=1'-0"



SECTION ...SCALE 1 1/2"=1'-0"

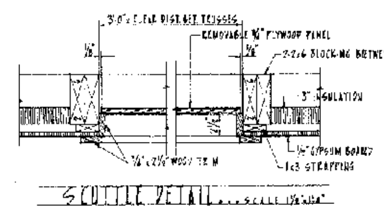
DETAIL ...SCALE 1 1/2"=1'-0"



TEMPERED PRESSED-WOOD WAINSCOT

WOOD SHEATHING WAINSCOT

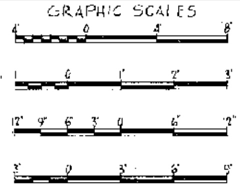
WAINSCOT DETAILS...SCALE 3"=1'-0"

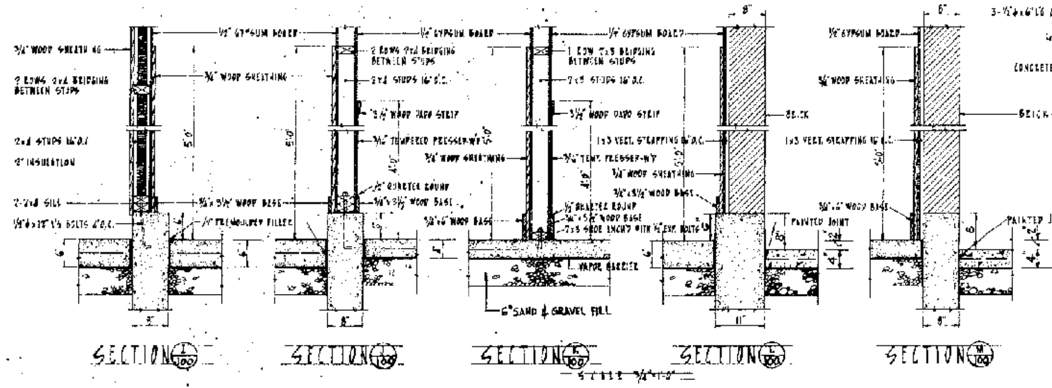


SCUTTLE DETAIL...SCALE 1 1/2"=1'-0"

ROOM FINISH SCHEDULE								
NO.	ROOM	FLOOR	BASE	WAINSCOT	WALLS	CEILING	TRIM	REMARKS
①	OFFICE	ASPHALT TILE	WOOD	3/16" TEMPERED PRESSED-WOOD 4'-0" HIGH	1/2" GYPSUM BOARD	1/2" GYPSUM BOARD	WOOD	
②	HALL	CONCRETE	"	"	"	"	"	
③ ④ ⑤	TOILETS	"	"	"	1/2" GYPSUM BOARD SEE "REMARKS"	1/2" GYPSUM BOARD SEE "REMARKS"	"	2 LAYERS 1/2" GYPSUM BOARD WALLS & CEILINGS, ROOMS 4 & 5
⑥	HEATER ROOM	"	"	"	5/8" UL FIRE RATED GYPSUM BOARD	5/8" UL FIRE RATED GYPSUM BOARD	"	
⑦	STOCK ROOM	"	"	"	1/2" GYPSUM BOARD	1/2" GYPSUM BOARD	"	
⑧	STORAGE	"	"	3/4" T.&G. HORIZ. WOOD SHEATHING 5'-0" HIGH	"	"	"	
⑨	WORK SHOP	"	"	"	"	"	"	
⑩	DEAD STORAGE	"			EXPOSED STUDS & EXTERIOR WALLS & 3/4" T.G. SHEATHING INTERIOR WALL	EXPOSED TRUSSES	WOOD DOOR 102 ONLY	HORIZONTAL SHEATHING FOR INTERIOR WALL SHALL EXTEND UP TO UNDERSIDE OF ROOF BOARDS
⑪	FIREPROOF RM.	"			EXPOSED BRICK	EXPOSED CONCRETE		

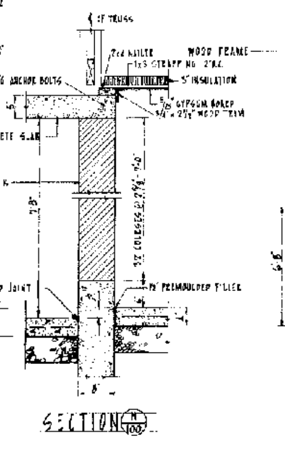
DOOR SCHEDULE						
NO.	TYPE	SIZE	MATERIAL	JAMB TYPE	THRESHOLD	REMARKS
(100)	A	3'-0" x 6'-8" x 1 3/4"	WOOD	J	METAL	WITH ALUM. COMB. STORM & SCREEN DOOR
(101)	B	2'-8" x 6'-8" x 1 3/4"	"	J2	METAL	
(102)	B	2'-8" x 6'-8" x 1 3/4"	"	J5		
(103)	B	2'-8" x 6'-8" x 1 3/4"	"	J1	METAL	
(104)	C	2'-6" x 6'-8" x 1 3/4"	"	J6	METAL	
(105)	C	2'-6" x 6'-8" x 1 3/4"	"	J6	METAL	
(106)	D	2'-8" x 6'-8" x 1 3/8"	"	J3		
(107)	E	2'-8" x 6'-8" x 1 3/8"	"	J3		UNDER CUT
(108)	D	2'-8" x 6'-8" x 1 3/8"	"	J4		
(109)	F	2'-8" x 6'-8" x 1 3/4"	METAL	J3		CLASS "B" FIRE DOOR & FRAME WITH CLOSER
(110)	E	2'-6" x 6'-8" x 1 3/8"	WOOD	J3		LOUVERED
(111)	F	3'-0" x 6'-8" x 1 3/4"	MET.-CLAD	SEE SECT.	METAL	CLASS "A" FIRE DOOR WITH FUSIBLE LINK HOLDER ARM
(112)	G	2'-8" x 6'-8" x 1 3/8"	WOOD	SEE DET.		


GRAPHIC SCALES

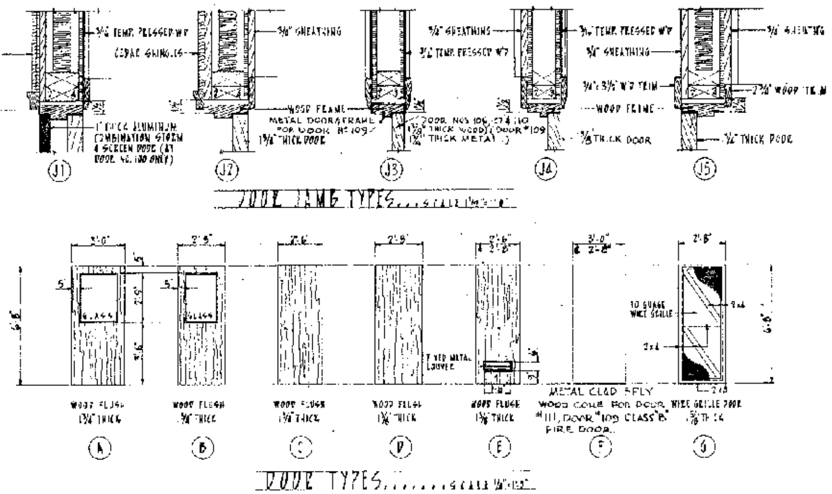


SECTION SECTION SECTION SECTION SECTION

SCALE 3/4"=1'-0"



SECTION


CEDAR SHINGLES
3/4" SHEATHING
3/16" TEMP. PRESSED WD
WOOD FRAME
1 3/4" THICK DOOR
1 3/8" THICK DOOR
1" DEEP ALUMINUM COMBINATION STORM & SCREEN DOOR (AT DOOR NO. 100 ONLY)
METAL DOOR & FRAME FOR DOOR NO. 109
J1
J2
J3
J4
J5
WOOD FLUSH 1 3/4" THICK
WOOD FLUSH 1 3/8" THICK
METAL CLAD PLY WOOD CORE FOR DOOR 111, DOOR 109 CLASS "B" FIRE DOOR
A
B
C
D
E
F
G

DOOR JAMB TYPES...SCALE 1 1/2"=1'-0"

DOOR TYPES.......SCALE 1/4"=1'-0"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.S. DR. BY J.O. CK. BY
SUBMITTED: CHIEF, ARCH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED: CHIEF, P. & R. BRANCH

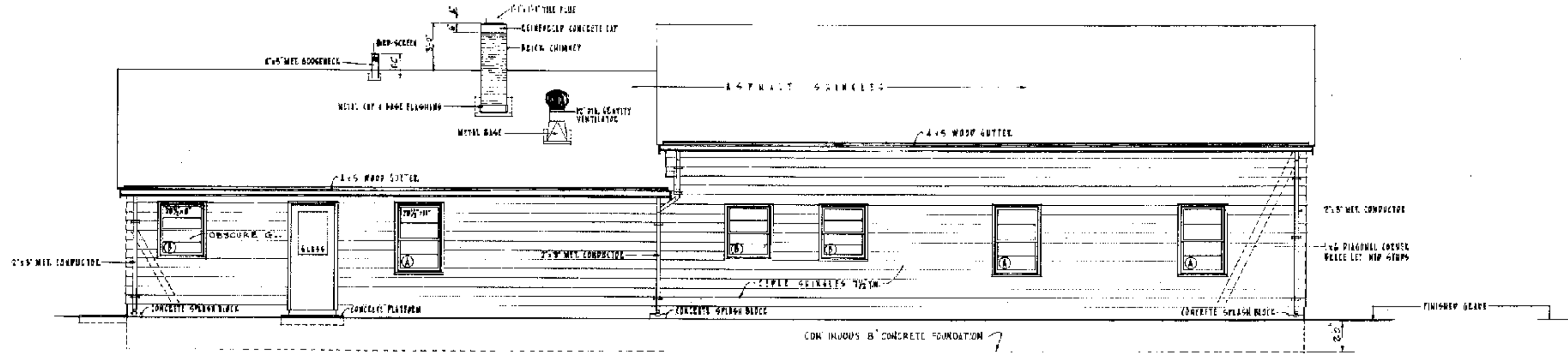
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
UTILITY BUILDING
SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED: CHIEF, ENGINEERING DIVISION
DATE: MARCH, 1962

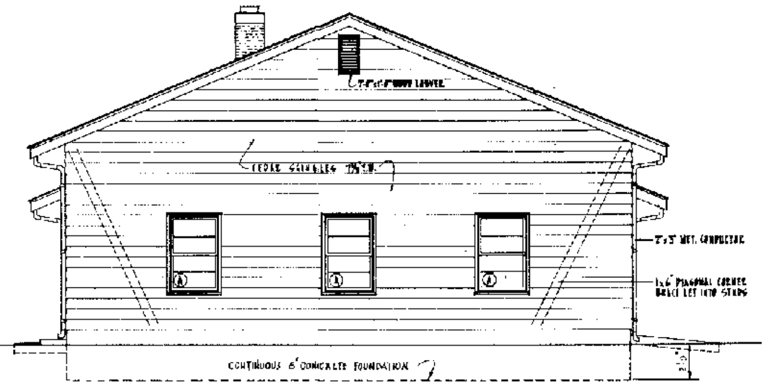
SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5808
SHEET 102

CORPS OF ENGINEERS

U. S. ARMY

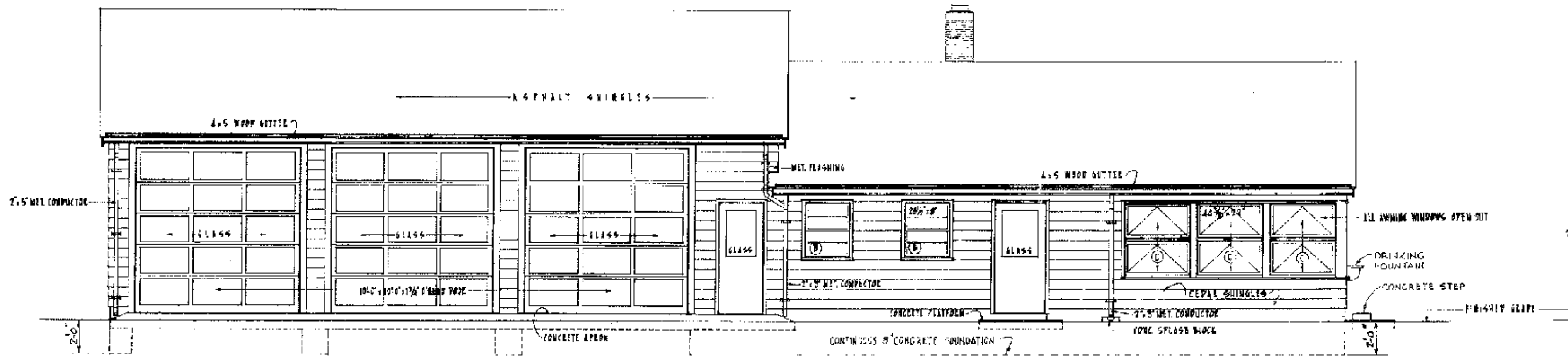


EAST ELEVATION SCALE ⅛"=1'-0"

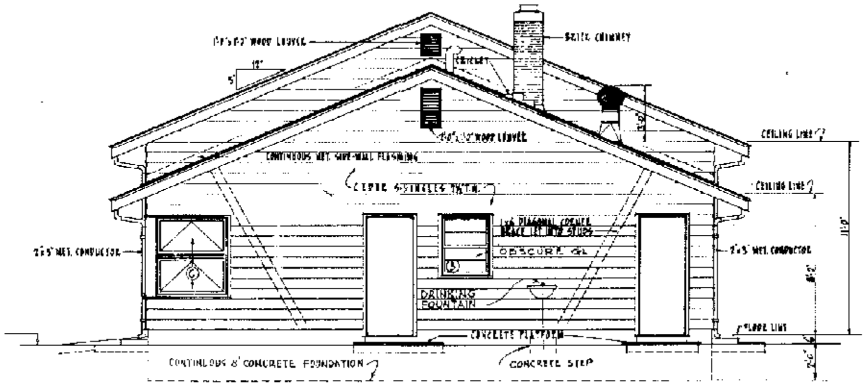


WOOD LOUVER
CEDAR SHINGLES 7½" T.W.
2"x3" MET. CONDUCTOR
1x6 DIAGONAL CORNER BRACE LET INTO STUDS
CONTINUOUS 8" CONCRETE FOUNDATION
A

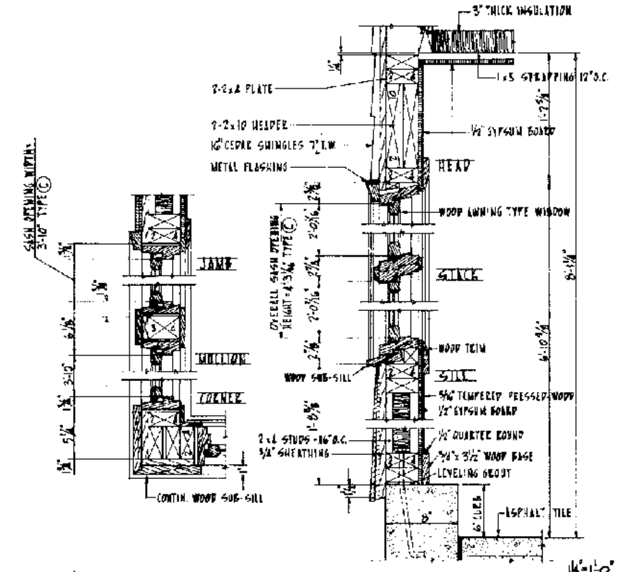
NORTH ELEVATION SCALE ⅛"=1'-0"



WEST ELEVATION SCALE ⅛"=1'-0"



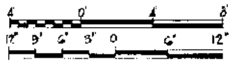
SOUTH ELEVATION SCALE ⅛"=1'-0"



SECTION 2/101 SCALE 1½"=1'-0"

TYPE C WINDOW

GRAPHIC SCALES

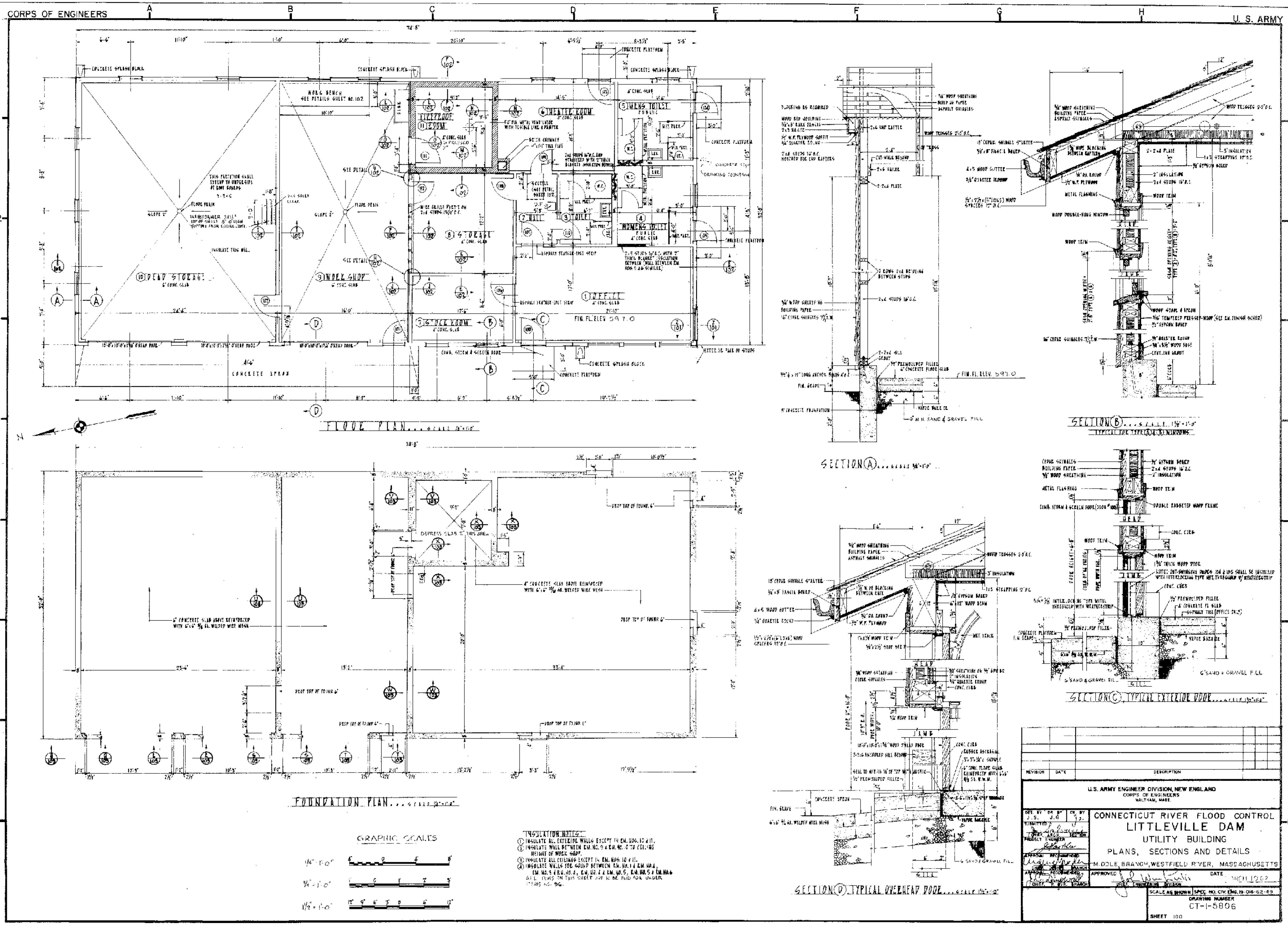


REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.S. DR. BY J.G. CK. BY J.P.	CONNECTICUT RIVER FLOOD CONTROL
SUBMITTED CHIEF, ARCH. SECTION	LITTLEVILLE DAM
PROJECT ENGINEER	UTILITY BUILDING ELEVATIONS AND DETAILS
APPROVAL RECOMMENDED CHIEF, DESIGN BRANCH	MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS
APPROVAL RECOMMENDED CHIEF, F&R BRANCH	APPROVED CHIEF, ENGINEERING DIVISION DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5807
SHEET 101


FLOOR PLAN... SCALE 1/4"=1'-0"
FOUNDATION PLAN... SCALE 1/4"=1'-0"
SECTION (A)... SCALE 3/4"=1'-0"
SECTION (B)... SCALE 1 1/2"=1'-0"
TYPICAL FOR TYPE (A)&(B) WINDOWS
SECTION (C) TYPICAL EXTERIOR DOOR... SCALE 1 1/2"=1'-0"
SECTION (D) TYPICAL OVERHEAD DOOR... SCALE 1 1/2"=1'-0"
(10) DEAD STORAGE
(9) WORK SHOP
(11) FIREPROOF ROOM
(8) STORAGE
(7) STOCK ROOM
(6) HEATER ROOM
(5) MENS TOILET
(4) WOMENS TOILET
(3) TOILET
(2) HALL
(1) OFFICE
WORK BENCH SEE DETAILS SHEET NO. 102
CONCRETE APRON
CONCRETE PLATFORM
CONCRETE SPLASH BLOCK
DRINKING FOUNTAIN
FIN. FL. ELEV. 597.0
DEPRESS SLAB 2" THIS AREA
4" CONCRETE SLAB ABOVE REINFORCED WITH 6"x6" 10/10 GA. WELDED WIRE MESH
6" CONCRETE SLAB ABOVE REINFORCED WITH 6"x6" 6/6 GA. WELDED WIRE MESH
6" SAND & GRAVEL FILL
GRAPHIC SCALES
1/4"=1'-0"
3/4"=1'-0"
1 1/2"=1'-0"
N

INSULATION NOTES:
① INSULATE ALL EXTERIOR WALLS EXCEPT IN RM. NOS. 10 & 11.
② INSULATE WALL BETWEEN RM. NO. 9 & RM. NO. 6 TO CEILING HEIGHT OF WORK SHOP.
③ INSULATE ALL CEILINGS EXCEPT IN RM. NOS. 10 & 11.
④ INSULATE WALLS FOR SOUND BETWEEN RM. NO. 1 & RM. NO. 4, RM. NO. 3 & RM. NO. 4, RM. NO. 4 & RM. NO. 5, RM. NO. 5 & RM. NO. 6
ALL ITEMS ON THIS SHEET ARE TO BE PAID FOR UNDER ITEMS NO. 96.

REVISION	DATE	DESCRIPTION

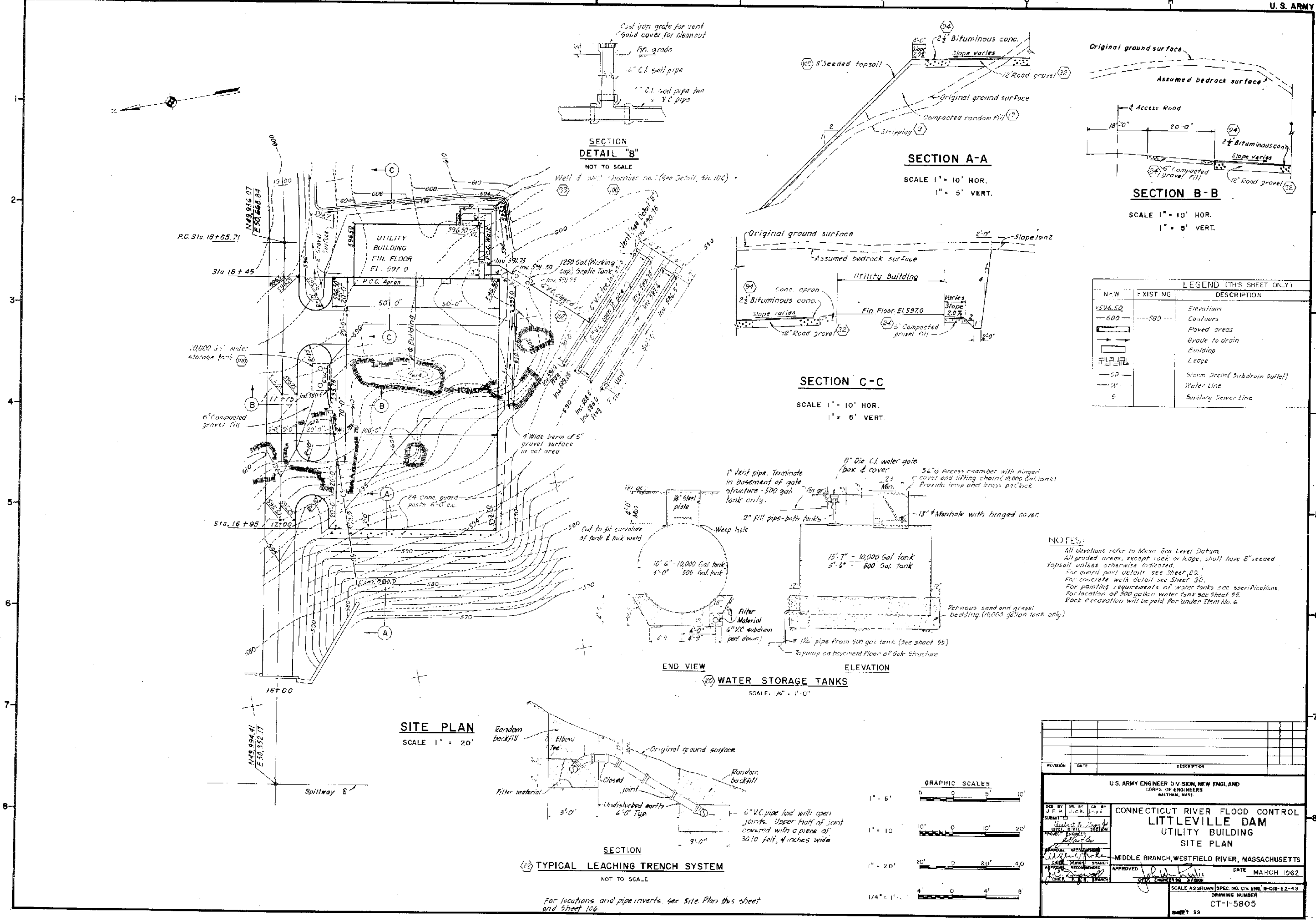
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.S. DR. BY J.G. CK. BY J.S.
SUBMITTED
CHIEF, ARCH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
UTILITY BUILDING
PLANS, SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5806
SHEET 100


Cast iron grate for vent
Solid cover for cleanout
Fin. grade
6" C.I. soil pipe
C.I. soil pipe tee
V.C. pipe
Well & well chamber no.1 (See Detail, Sh. 104)
UTILITY BUILDING FIN. FLOOR FL. 597.0
P.C.C. Apron
P.C.C. Walk
1250 Gal. (Working cap.) Septic Tank
Inv. 591.50
Inv. 591.75
Vent (See Detail "B")
Inv. 590.75
Inv. 589.75
Inv. 589.25
Inv. 588.0
Plug
4" V.C. pipe (open jt.)
4" Wide berm of 6" gravel surface in cut area
24 Conc. guard posts 6'-0" c.c.
10,000 Gal. water storage tank
6" Compacted gravel fill
6" Gravel Surface
P.C. Sta. 18+65.71
Sta. 18+45
Sta. 17+75
Sta. 16+95
16+00
N49,936.07
E50,668.84
N49,994.41
E50,352.17
Spillway ℄
8" Seeded topsoil
2½" Bituminous conc.
Slope varies
12" Road gravel
Original ground surface
Compacted random fill
Stripping
Assumed bedrock surface
℄ Access Road
18'-0"
20'-0"
6" Compacted gravel fill
Slope 1 on 2
Utility Building
Conc. apron
Fin. Floor El. 597.0
Varies Slope 2.0%
1" Vent pipe. Terminate in basement of gate structure - 500 gal. tank only.
2" Fill pipe - both tanks
¼" Steel plate
Weep hole
Cut to fit curvature of tank & tack weld
10'-6" - 10,000 Gal. tank
4'-0" - 500 Gal. tank
Filter Material
6" V.C. subdrain (pitch down)
8" Dia. C.I. water gate box & cover
36" Access chamber with hinged cover and lifting chain (10,000 Gal. tank) Provide hasp and brass padlock
18" Manhole with hinged cover
15'-7" - 10,000 Gal. tank
5'-6" - 500 Gal. tank
Pervious sand and gravel bedding (10,000 gallon tank only)
1¼" pipe from 500 gal. tank (see sheet 55)
To pump on basement floor of Gate Structure
Random backfill
Elbow
Tee
Filter material
Closed joint
Undisturbed earth 6'-0" Typ.
4" V.C. pipe laid with open joints. Upper half of joint covered with a piece of 30 lb felt, 4 inches wide
3'-0"
GRAPHIC SCALES
1" = 5'
1" = 10
1" = 20'
1/4" = 1'-0"

SECTION
DETAIL "B"
NOT TO SCALE

SECTION A-A
SCALE 1" = 10' HOR.
1" = 5' VERT.

SECTION B-B
SCALE 1" = 10' HOR.
1" = 5' VERT.

SECTION C-C
SCALE 1" = 10' HOR.
1" = 5' VERT.

END VIEW

ELEVATION

(100) WATER STORAGE TANKS
SCALE: 1/4" = 1'-0"

SITE PLAN
SCALE 1" = 20'

SECTION
(102) TYPICAL LEACHING TRENCH SYSTEM
NOT TO SCALE

For locations and pipe inverts see Site Plan this sheet and Sheet 106.

LEGEND (THIS SHEET ONLY)

NEW	EXISTING	DESCRIPTION
×596.50		Elevations
— 600 —	--- 580 ---	Contours
▭		Paved areas
→ →		Grade to drain
▭		Building
▨		Ledge
— SD —		Storm Drain (Subdrain Outlet)
— W —		Water Line
S —		Sanitary Sewer Line

NOTES:

All elevations refer to Mean Sea Level Datum.

All graded areas, except rock or ledge, shall have 8" seeded topsoil unless otherwise indicated.

For guard post details see Sheet 29.

For concrete walk detail see Sheet 30.

For painting requirements of water tanks see specifications.

For location of 500 gallon water tank see Sheet 55.

Rock excavation will be paid for under Item No. 6.

REVISION	DATE	DESCRIPTION

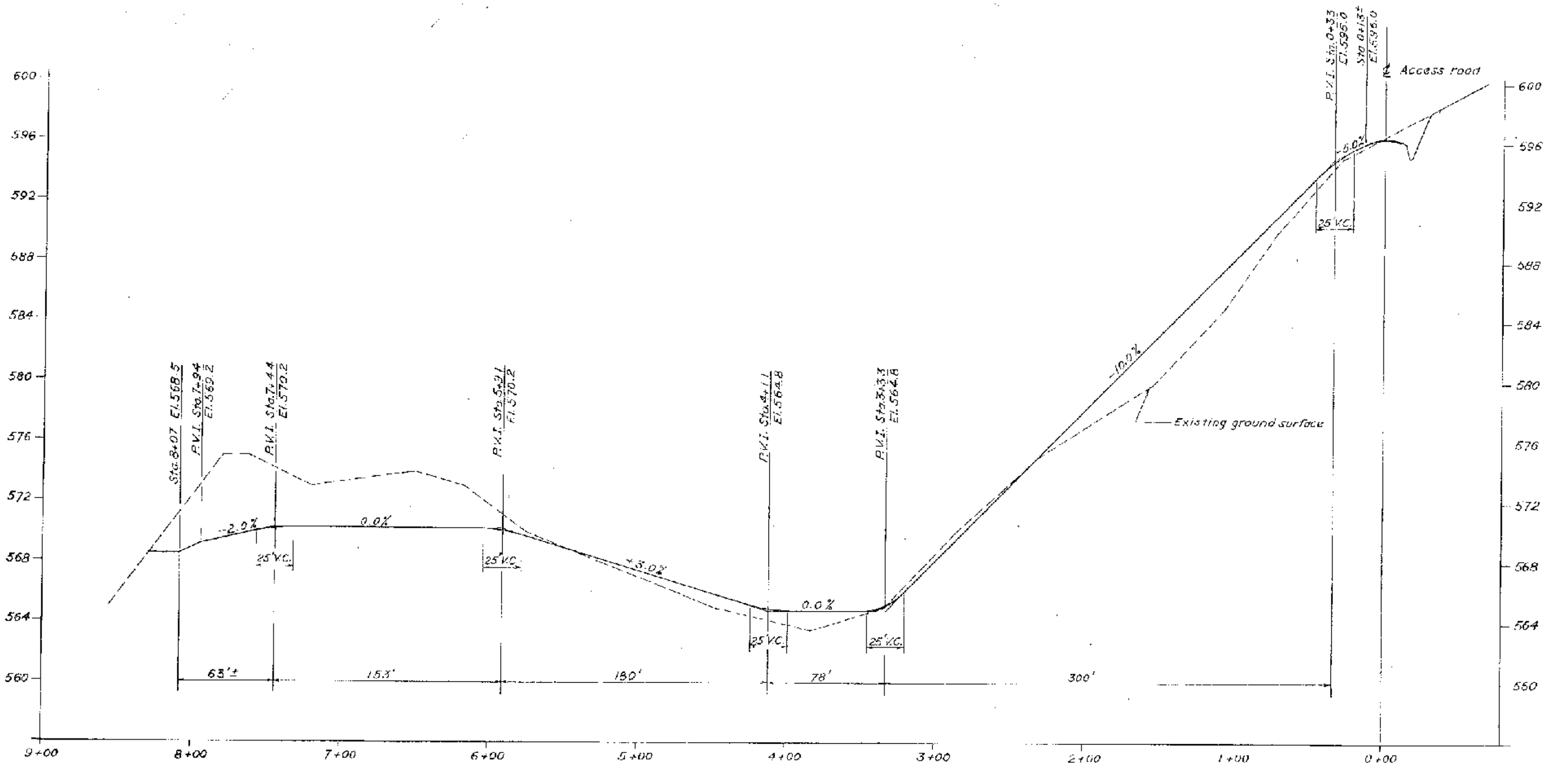
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.F.H. | DR. BY J.C.B. | CH. BY
SUBMITTED Herbert E. [illegible] CHIEF, CIVIL SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED CHIEF, P. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
UTILITY BUILDING
SITE PLAN
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

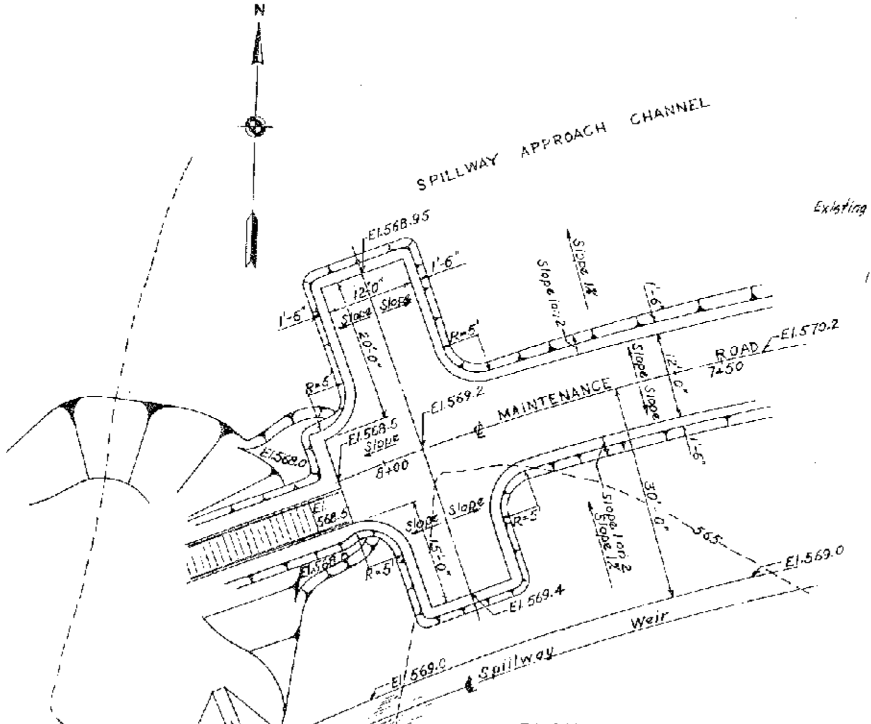
APPROVED John W. [illegible]
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5805
SHEET 99



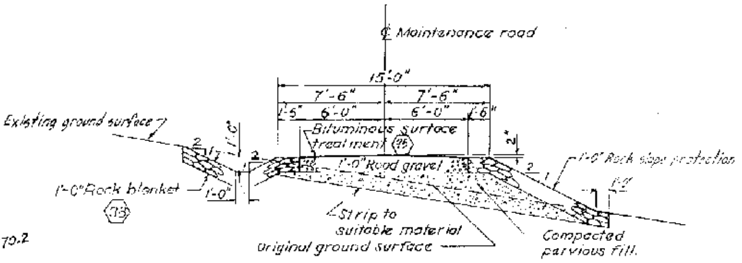
PROFILE ALONG ℄ MAINTENANCE ROAD

SCALES: HOR. 1" = 40'
VERT. 1" = 4'

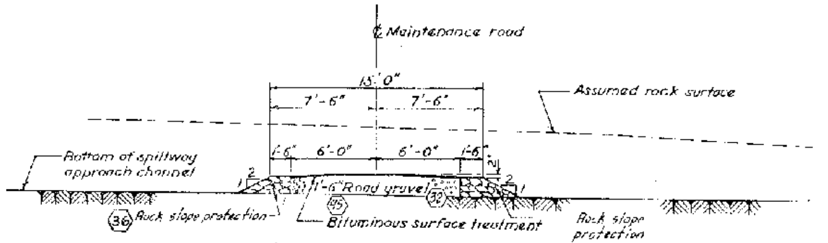


PLAN
TURNAROUND

SCALE: 1" = 10'



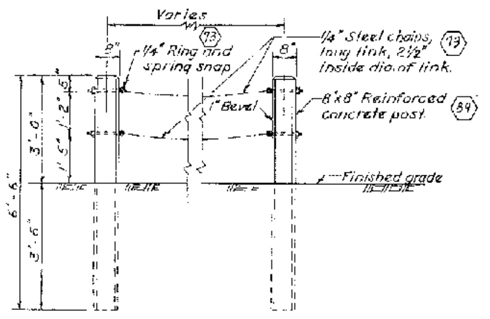
SECTION ON EARTH



SECTION ON ROCK

TYPICAL SECTIONS OF MAINTENANCE ROAD

SCALE: 1" = 5'


Varies
(73)
8"
8"
¼" Ring and spring snap
¼" Steel chains, long link, 2½" inside dia. of link. (73)
1" Bevel
8"x8" Reinforced concrete post. (34)
Finished grade
3'-0"
1'-5"
1'-2"
5"
6'-6"
3'-6"

CHAIN BARRIER

(For location see Sheet No. 31)

SCALE. 1/2" = 1'-0"

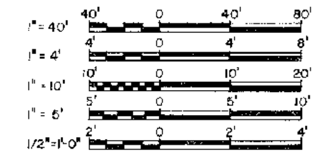
NOTES:

Elevations refer to mean sea level datum.

Figures in hexagons indicate item numbers under which payment will be made.

For plan of Maintenance Road see sheet No. 31.

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
P. H.	B. C. N.	J.H.

PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
MAINTENANCE ROAD
PROFILE, SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVAL RECOMMENDED
CHIEF, P. & R. BRANCH

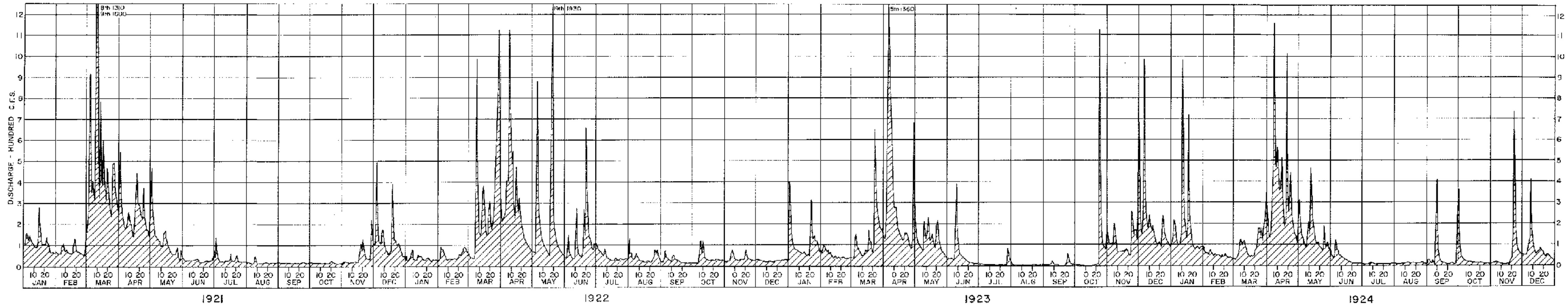
APPROVED
CHIEF, ENGINEERING DIVISION

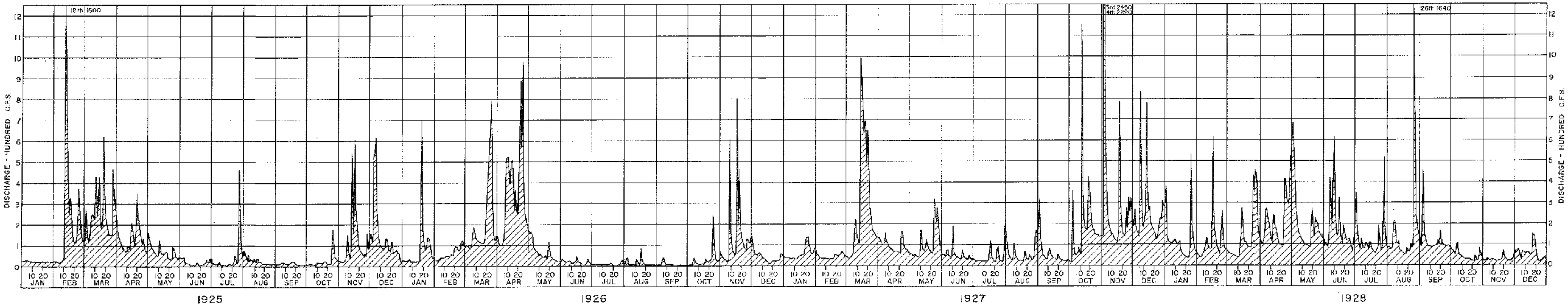
DATE MARCH 1962

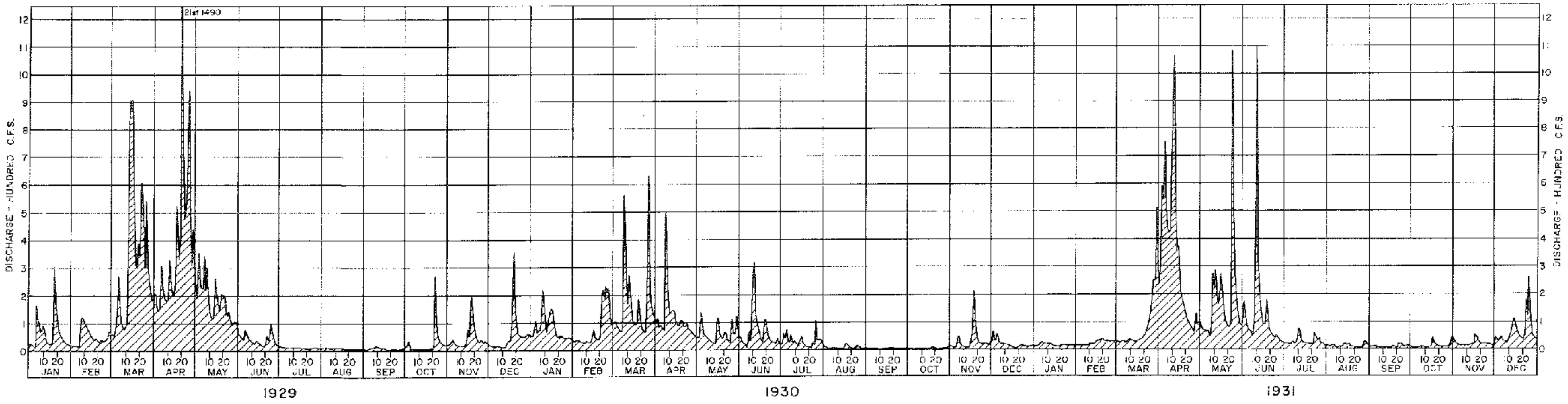
SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5804
SHEET 88

CORPS OF ENGINEERS

U. S. ARMY







NOTES

1. These hydrographs are the daily average stream flow record of Middle Branch Westfield River, Goss Heights, Massachusetts from the tributary drainage area of 52.6 Square Miles.

2. Instantaneous peak discharges are shown where available.

3. The data contained herein are not intended as representations or warrantees but are furnished for information only. It is expressly understood that the government will not be responsible for any deductions, interpretations or conclusions therefrom made by any bidder or contractor.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DR. BY R.L.B.
CK. BY E.P.S.

SUBMITTED E. F. Chinda
CHIEF HYD. & HYD SECTION

PROJECT ENGINEER J. Hartley

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE RESERVOIR
HYDROGRAPHS NO. 2
MIDDLE BRANCH WESTFIELD RIVER, MASS.

APPROVAL RECOMMENDED J. C. Dingwall
CHIEF P. & R. BRANCH

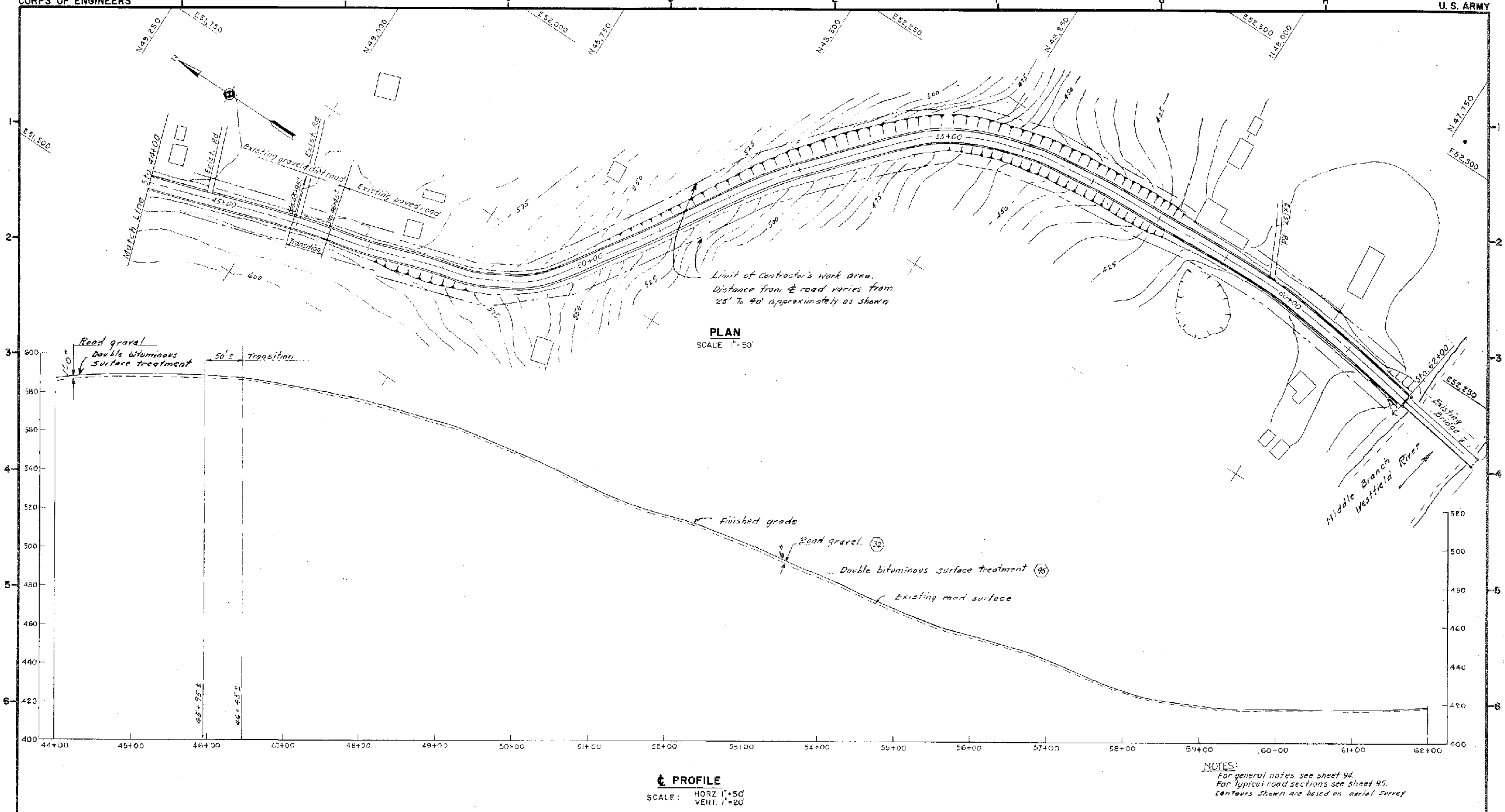
APPROVED John Wm. Leslie
CHIEF ENGINEERING DIVISION

DATE [illegible]

SCALE: AS SHOWN
SPEC. NO. CIV. ENG-19-016-[illegible]

DRAWING NUMBER
CT 1-5727

SHEET 4



NOTES:
For general notes see sheet 94.
For typical road sections see sheet 95.
Contours shown are based on aerial survey

GRAPHIC SCALES
1"=20' 20' 0 20' 40'
1"=50' 50' 0 50' 100'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

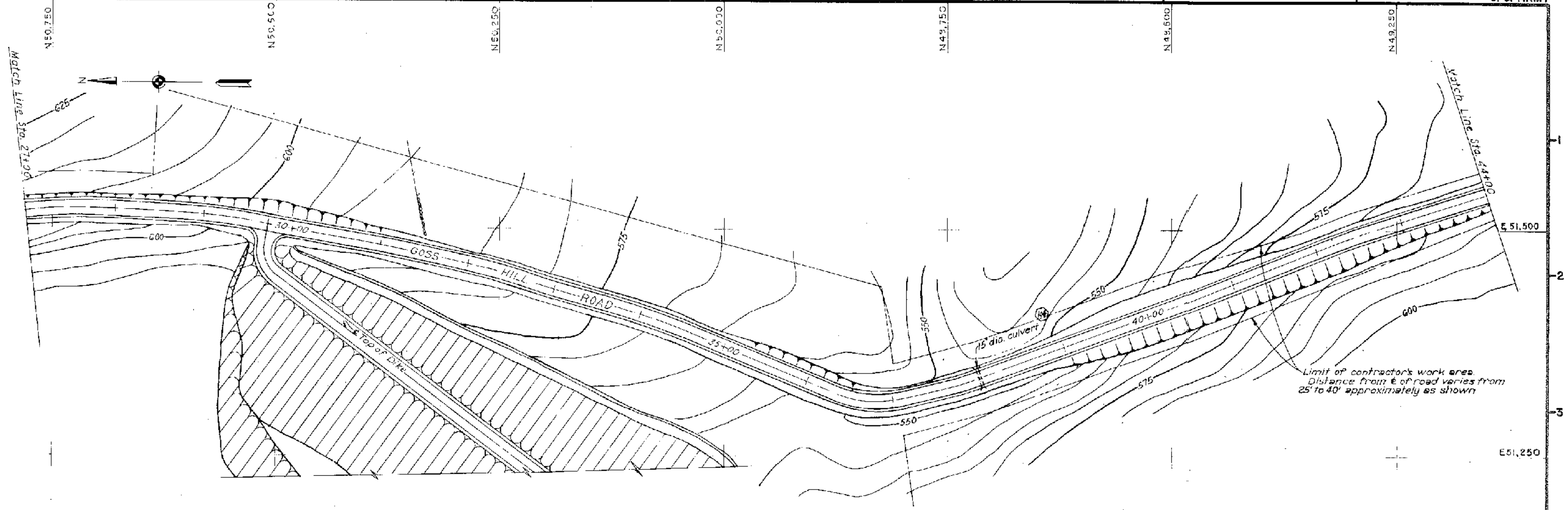
DES. BY H. McL. | DR. BY D.L.W. | CK. BY
SUBMITTED Herbert D. Hiron, Jr. CHIEF, CIVIL SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED CHIEF, F. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GOSS HILL ROAD IMPROVEMENT
PLAN AND PROFILE NO. 4
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

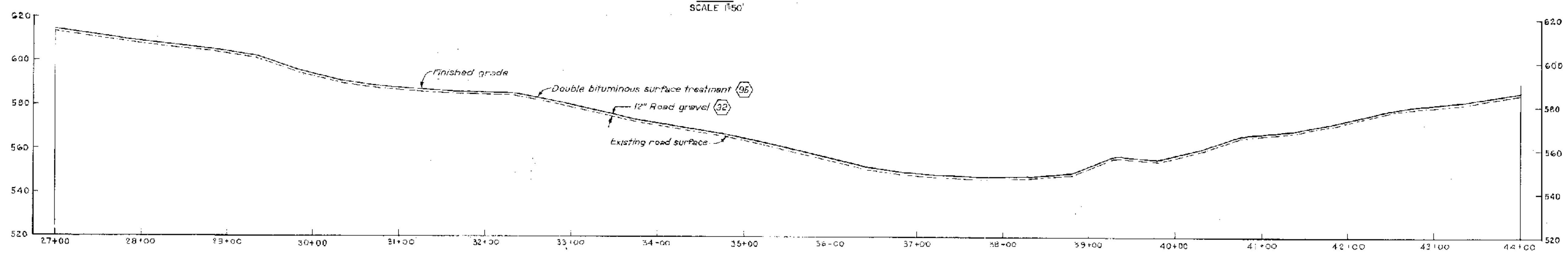
APPROVED CHIEF, ENGINEERING DIVISION
DATE MARCH 1962
SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5803
SHEET 97

CORPS OF ENGINEERS

U. S. ARMY



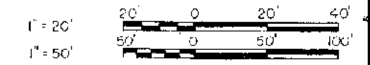
PLAN
SCALE 1"=50'



℄ PROFILE
SCALE HORZ. 1"=50'
VERT. 1"=20'

NOTES:
For general notes see sheet 94.
For typical road sections see sheet 95.

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

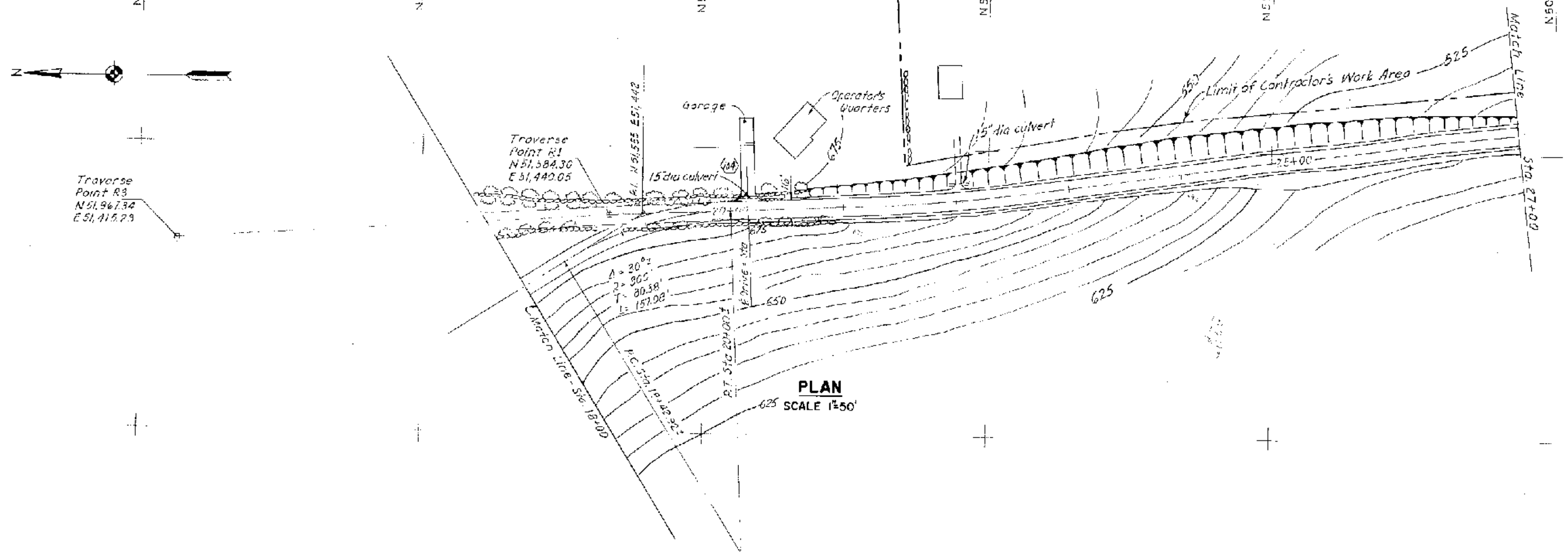
DES. BY J.F.H. | DR. BY J.F.H. | CK. BY RGR
SUBMITTED Herbert E. Hoop Jr.
CHIEF, CIVIL SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GOSS HILL ROAD IMPROVEMENT
PLAN AND PROFILE NO.3
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

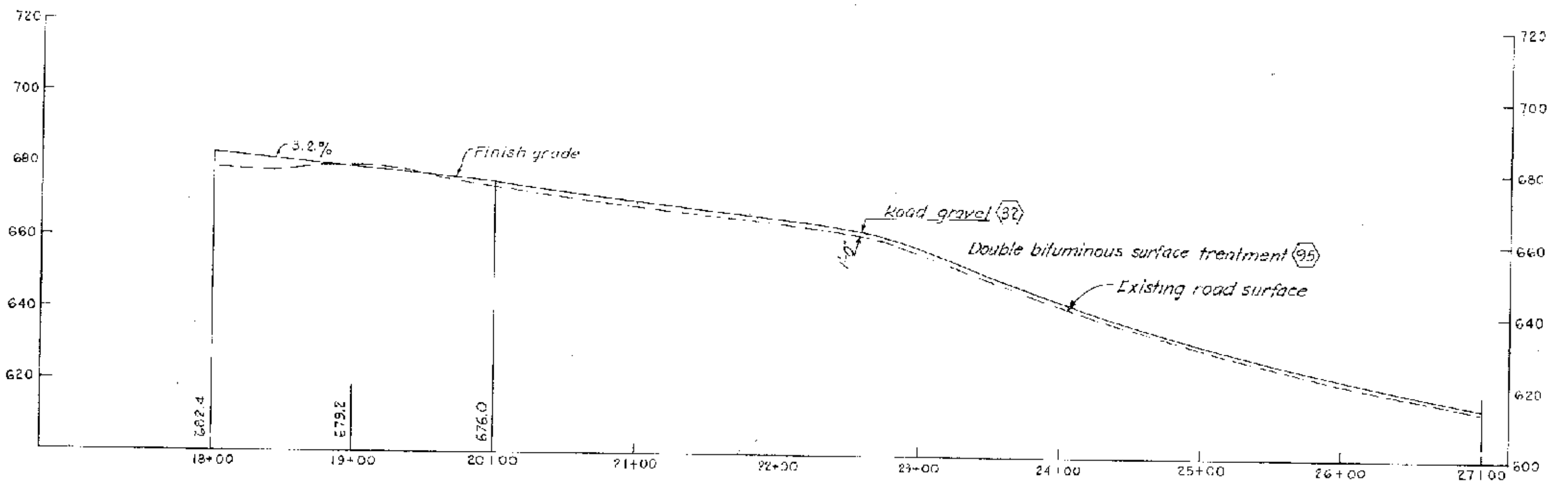
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MAR 1962

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5802
SHEET 96

CORPS OF ENGINEERS — U.S. ARMY

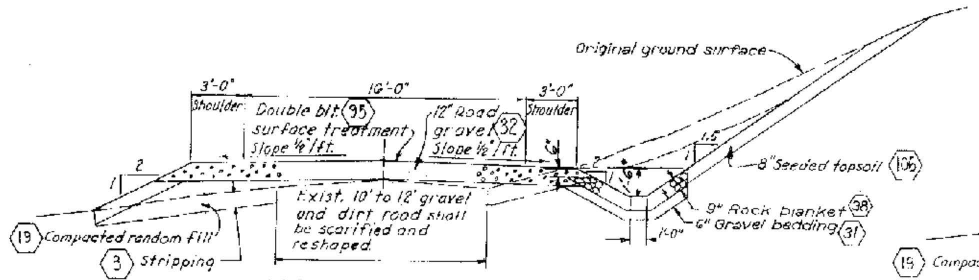


PLAN
SCALE 1"=50'

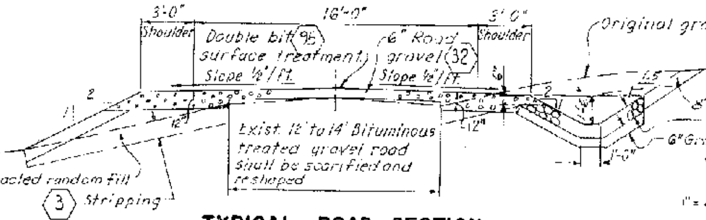


℄ PROFILE
SCALE: HORZ. 1"=50' VERT. 1"=20'

NOTES:
For general notes see sheet 94.
Figures in hexagons indicates item numbers under which payment will be made.
Stone walls will be removed where they interfere with work of road improvement, and will be paid for under item 3.

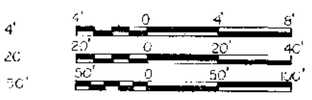


TYPICAL ROAD SECTION
STA. 20+00 TO STA. 45+95±
SCALE 1"=4'



TYPICAL ROAD SECTION
STA. 46+45± TO STA. 62+00
SCALE 1"=4'

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

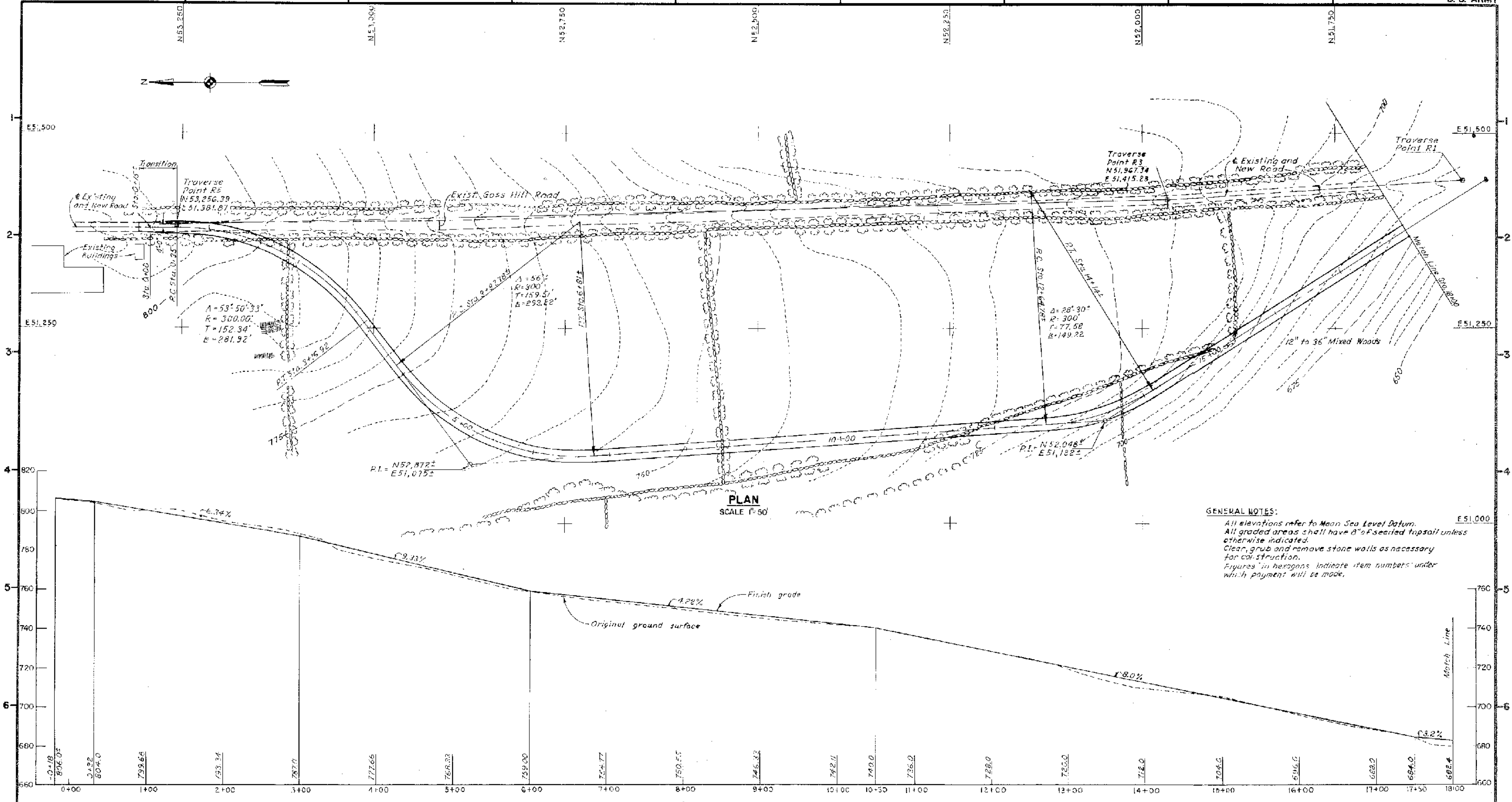
DES. BY J.F.H. | DR. BY J.F.H. | CK. BY
SUBMITTED Herbert S. Gray Jr. CHIEF, CIVIL SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED CHIEF, P. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GOSS HILL ROAD IMPROVEMENT
PLAN AND PROFILE NO.2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED CHIEF, ENGINEERING DIVISION
DATE MAR. 1962

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5801
SHEET 95

CORPS OF ENGINEERS U. S. ARMY

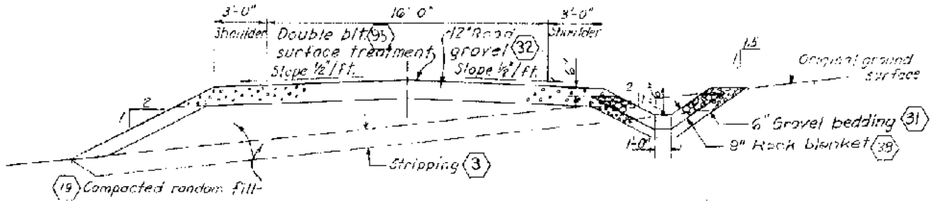


PLAN
SCALE 1"=50'

℄ PROFILE
SCALE: HORZ. 1"=50' VERT. 1"=20'

GENERAL NOTES:

All elevations refer to Mean Sea Level Datum.
All graded areas shall have 8" of seeded topsoil unless otherwise indicated.
Clear, grub and remove stone walls as necessary for construction.
Figures in hexagons indicate item numbers under which payment will be made.



TYPICAL ROAD SECTION
STA. 0+15 TO STA. 20+00
SCALE 1"=4'

GRAPHIC SCALES

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
J.F.H.	D.L.W.	[illegible]

SUBMITTED Herbert E. Hoag Jr. CHIEF, CIVIL SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED CHIEF, P. & R. BRANCH

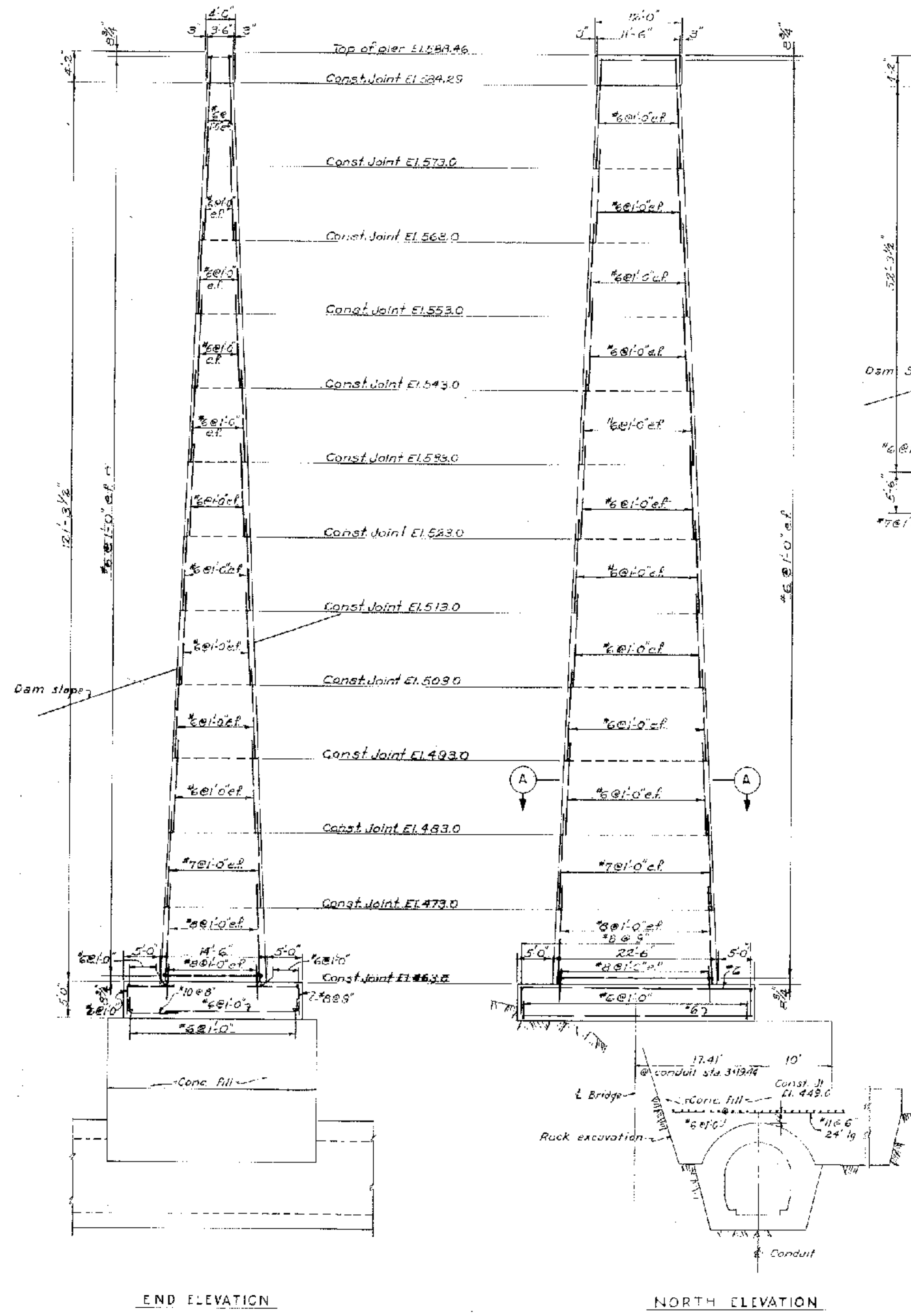
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GOSS HILL ROAD IMPROVEMENT
PLAN AND PROFILE NO. 1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED CHIEF, ENGINEERING DIVISION DATE MAR 1962

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5800
SHEET #4

CORPS OF ENGINEERS

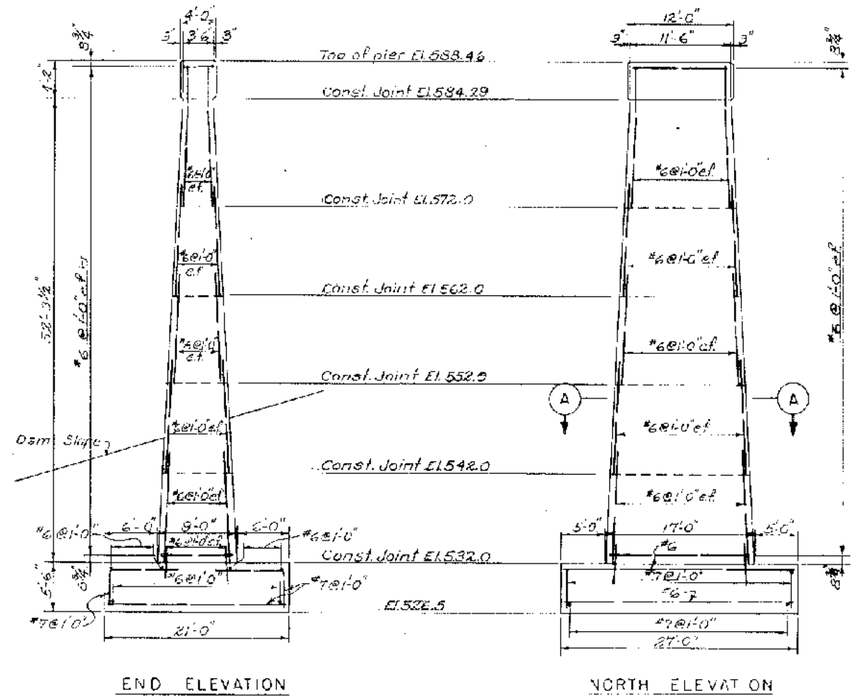
U. S. ARMY



END ELEVATION

NORTH ELEVATION

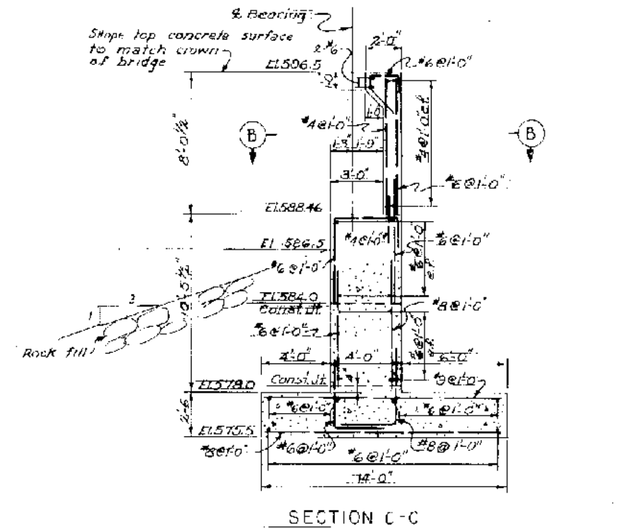
PIER NO. 2
SCALE 1/8"=1'-0"



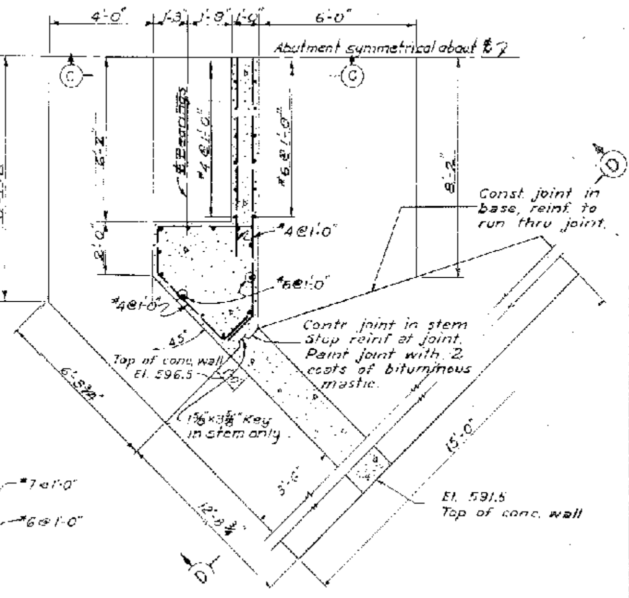
END ELEVATION

NORTH ELEVATION

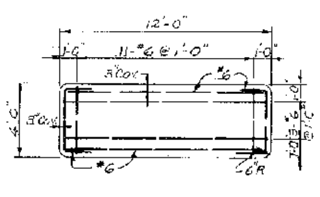
PIER NO. 1
SCALE 1/8"=1'-0"



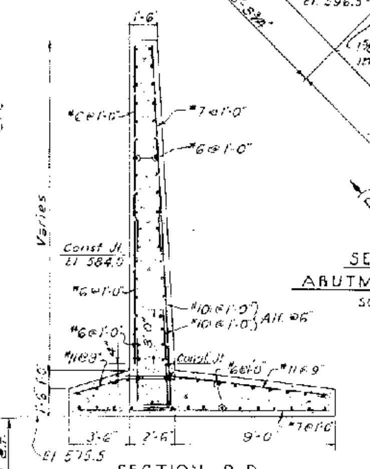
SECTION C-C
SCALE: 1/4"=1'-0"


Abutment symmetrical about ℄
Const. joint in base, reinf. to run thru joint.
Contr. joint in stem. Stop reinf. at joint. Paint joint with 2 coats of bituminous mastic.
Top of conc. wall El. 596.5
1½"x3⅝" Key in stem only
El. 591.5 Top of conc. wall

SECTION B-B
ABUTMENT DETAILS
SCALE 3/8"=1'-0"



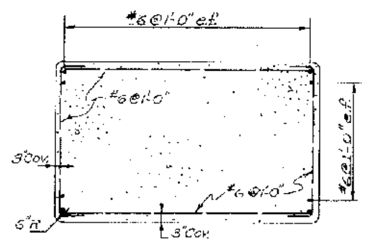
PLAN - PIER NO.1 & NO.2
SCALE: 1/4"=1'-0"



SECTION D-D
SCALE 1/4"=1'-0"

NOTES

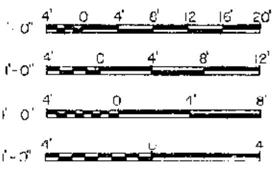
All construction joints above grade shall be V-joints conforming to construction joint detail on Sheet 34. Construction joints below grade shall be flush joints.



SECTION A-A
NOT TO SCALE

PAYMENT ITEM NUMBERS:
Steel bearing piling Item No. 36
Concrete for abutment & piers Item No. 60
Steel reinforcement Item No. 64

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.S.M. | DR. BY J.P.H. | CK. BY A.S.S.

SUBMITTED
CHIEF, STRUCT. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

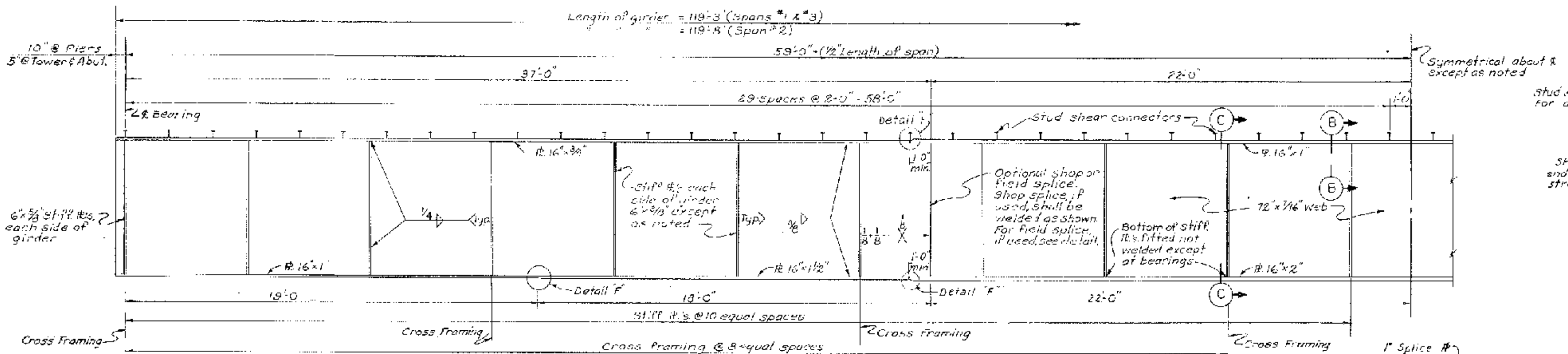
APPROVAL RECOMMENDED
CHIEF, P. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SERVICE BRIDGE
STRUCTURAL
PIERS AND ABUTMENT DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5799
SHEET 93

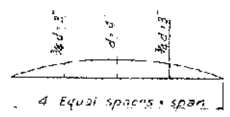

Length of girder = 119'-3" (Spans #1 & #3)
" " " = 119'-8" (Span #2)
10" @ Piers
5" @ Tower & Abut.
59'-0" + (½ Length of span)
37'-0"
22'-0"
29 Spaces @ 2'-0" = 58'-0"
1'-0"
Symmetrical about ℄ except as noted
℄ Bearing
Detail "I"
Stud shear connectors
6"×⅝" stiff. ℔s. each side of girder
℔ 16"×¾"
Stiff. ℔s each side of girder 6"×⅝" except as noted
¼
Typ.
⅜
⅛ + ⅛
1'-0" min.
Optional shop or field splice. Shop splice, if used, shall be welded as shown. For field splice, if used, see detail.
Bottom of stiff. ℔s fitted not welded except at bearings
72"×7/16" Web
℔ 16"×1"
℔ 16"×1½"
℔ 16"×2"
Detail "F"
19'-0"
18'-0"
22'-0"
Stiff. ℔s @ 10 equal spaces
Cross Framing
Cross Framing @ 8 equal spaces
B
C

For Detail "F" see Sh. No. 88

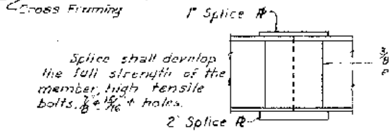
GIRDER ELEVATION

6 REQUIRED

SCALE: 3/8" = 1'-0"

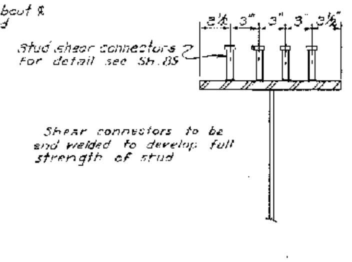


CAMBER DIAGRAM


1" Splice ℔
Splice shall develop the full strength of the member, high tensile bolts, ⅞" ⌀, 15/16" ⌀ holes.
⅜" Splice ℔ each side of web
2" Splice ℔

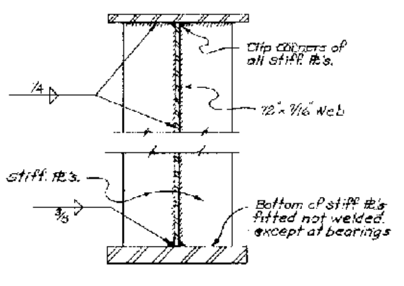
FIELD SPLICE DETAIL

NO SCALE


2½" 3" 3" 3" 3½"
Stud shear connectors for detail see Sh. 85
Shear connectors to be end welded to develop full strength of stud

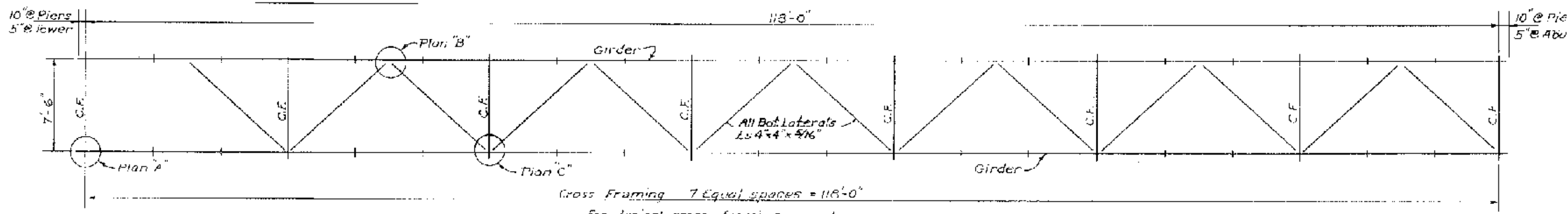
SECTION B-B

SCALE: 1 1/2" = 1'-0"


Clip corners of all stiff. ℔s.
¼
72"×7/16" Web
Stiff. ℔s.
⅜
Bottom of stiff ℔s fitted not welded except at bearings

SECTION C-C

NOT TO SCALE

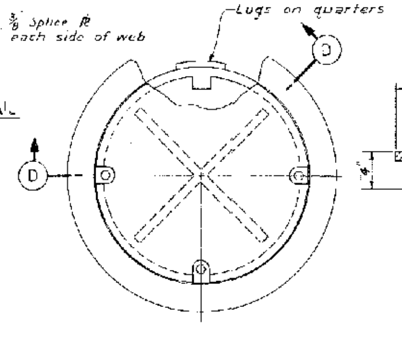


Cross Framing 7 Equal spaces = 118'-0"

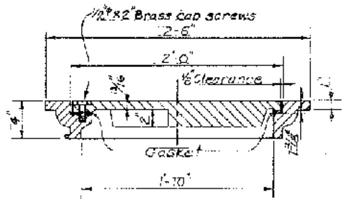
For typical cross framing members see Cross Section Sh. No. 91

FRAMING PLAN

NO SCALE



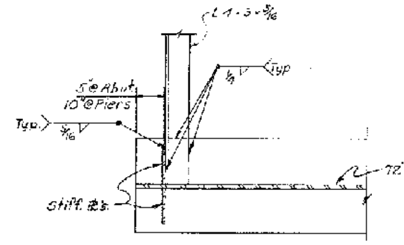
PLAN



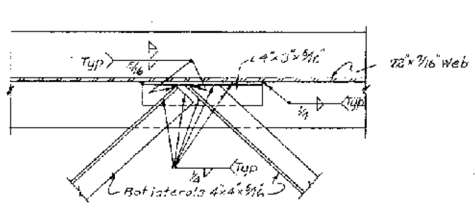
SECTION D-D

MANHOLE DETAILS

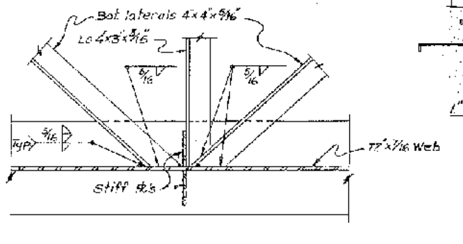
SCALE: 1 1/2" = 1'-0"



PLAN "A"



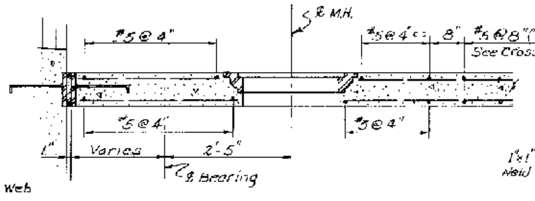
PLAN "B"



PLAN "C"

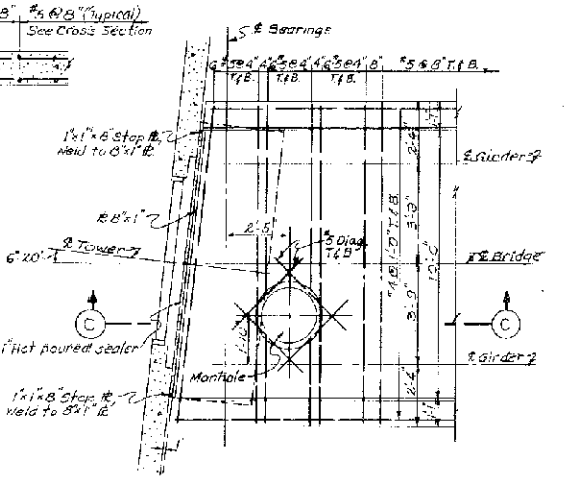
TYPICAL LATERAL BRACING CONNECTIONS

SCALE: 1" = 1'-0"



SECTION C-C

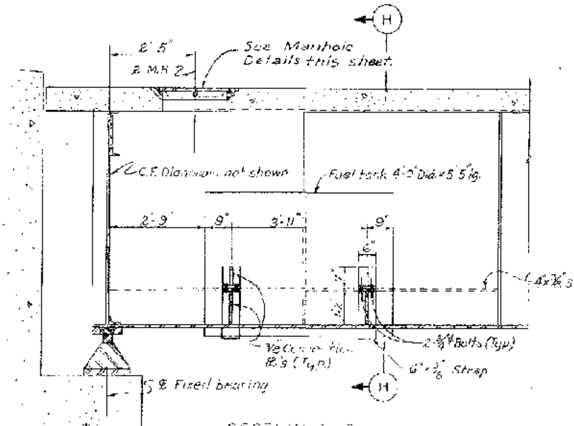
SCALE: 3/4" = 1'-0"



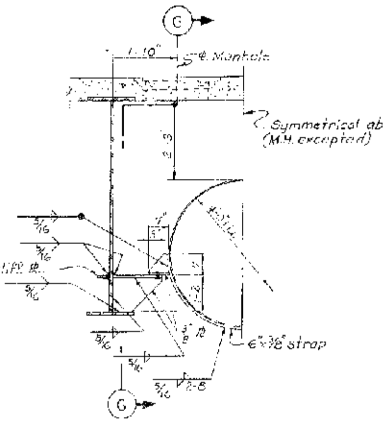
PLAN AT TOWER ENTRANCE

SCALE 3/8" = 1'-0"

NOTE:
For general notes applying to this sheet see Sheet No. 90.



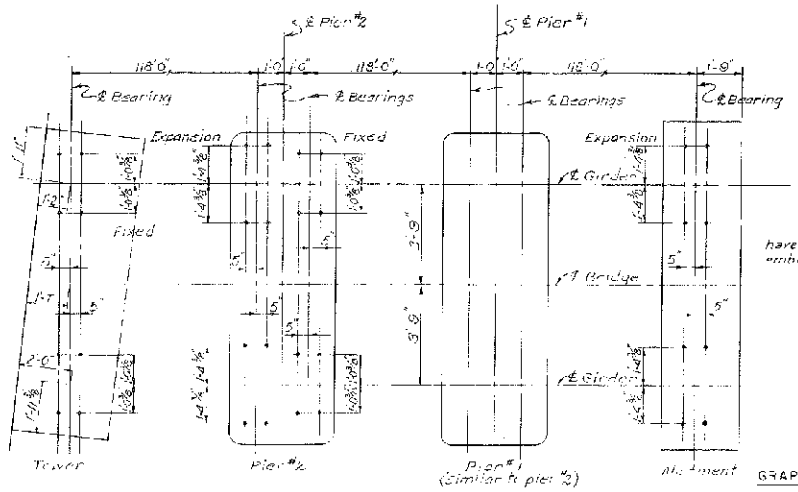
SECTION G-G



SECTION H-H

FUEL TANK DETAILS

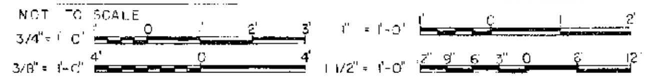
SCALE 1/2" = 1'-0"



Anchor bolts shall have a minimum conc. embedment of 1'-6"

ANCHOR BOLT PLAN

NOT TO SCALE



GRAPHIC SCALES

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

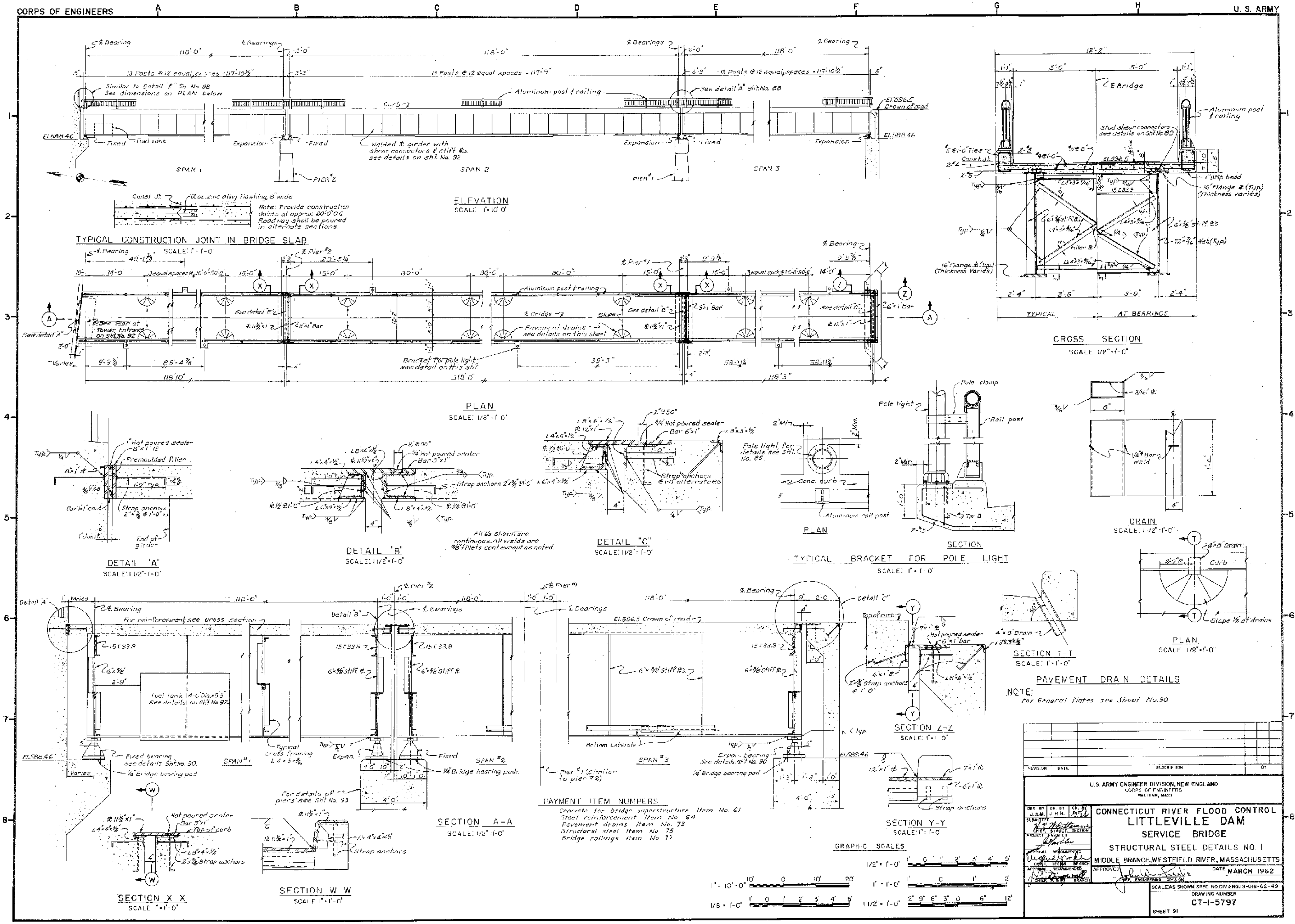
DES. BY J.S.M. | DR. BY J.P.H. | CK. BY
SUBMITTED H.L. Whittemore CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED CHIEF, E. & M. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SERVICE BRIDGE
STRUCTURAL STEEL DETAILS NO. 2

MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED: CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN | SPEC. NO. CIV ENG.-19-016-62-49
DRAWING NUMBER
CT-1-5798
SHEET 92


A
B
C
D
E
F
G
H
1
2
3
4
5
6
7
8
℄ Bearing
℄ Bearings
116'-0"
118'-0"
2'-0"
5"
2'-3"
13 Posts @ 12 equal spaces = 117'-10½"
13 Posts @ 12 equal spaces - 117'-9"
Similar to Detail "E" Sh. No 88
See dimensions on PLAN below
Aluminum post & railing
See detail "A" Sht. No. 88
El. 596.5 Crown of road
El. 588.46
Curb
Fixed
Fuel tank
Expansion
Welded ℄ girder with shear connectors & stiff ℄s. see details on sht. No. 92
SPAN 1
SPAN 2
SPAN 3
PIER #2
PIER #1
Const. Jt.
12 oz. zinc alloy flashing, 8" wide
Note: Provide construction joints at approx. 20'-0" O.C. Roadway shall be poured in alternate sections.
12'-2"
1'-1"
5'-0"
℄ Bridge
Aluminum post & railing
Stud shear connectors see details on Sht. No. 89
#5 @ 1'-0" Ties
Const. Jt.
2-#4
2-#5
#4 @ 1'-0"
#5 @ 8"
El. 596.0
1" Drip bead
16" Flange ℄ (Typ.) (Thickness varies)
15 [33.9
6×⅝" stiff. ℄s
72"×7/16" Web (Typ.)
Filler ℄
2'-4"
3'-6"
3'-9"
TYPICAL
AT BEARINGS
Typ.
¼V
49'-1⅜"
29'-5¼"
14'-0"
15'-0"
30'-0"
℄ Pier #2
℄ Pier #1
9'-9⅞"
118'-10"
319'-6"
119'-3"
39'-3"
58'-11⅛"
See detail "A"
See detail "B"
See detail "C"
2×1" Bar
6×1" Bar
Slope
Pavement drains see details on this sheet
Bracket for pole light see detail on this sht.
See Plan at Tower Entrance on Sht. No. 92
Varies
1" Hot poured sealer
Premoulded filler
Strap anchors 2×⅜ @ 1'-0" o.c.
End of girder
1" Joint
¾ Hot poured sealer
Bar 3"×1"
Bar 6"×1"
Strap anchors 2×⅜ @ 1'-0"
All L's shown are continuous. All welds are ⅜" fillets cont. except as noted.
Strap anchors @ 1'-0" alternate
Pole light
Pole clamp
Rail post
Pole light for details see Sht. No. 85
2" Min.
Conc. curb
Aluminum rail post
3/16" ℄
¼" Bar weld
1'-6"
6"
4"
4"×3" Drain
Curb
Slope ½" at drains
Detail "A"
Detail "B"
Detail "C"
For reinforcement see cross section
El. 596.5 Crown of road
15 [33.9
6×⅜" stiff. ℄
Fuel tank 4'-0" Dia. × 5'-6" See details on Sht. No. 92
Typical cross framing L 4×3×5/16
Fixed bearing see details Sht. No. 30
½" Bridge bearing pad
Expan. bearing See details Sht. No. 30
Bottom Laterals
SPAN #1
SPAN #2
SPAN #3
Pier #1 (similar to pier #2)
For details of piers see Sht. No. 93
Hot poured sealer
Top of curb
2×⅜ Strap anchors
Strap anchors
1" = 10'-0"
1/8" = 1'-0"
1/2" = 1'-0"
1" = 1'-0"
1 1/2" = 1'-0"

ELEVATION
SCALE 1" = 10'-0"

TYPICAL CONSTRUCTION JOINT IN BRIDGE SLAB
SCALE 1" = 1'-0"

CROSS SECTION
SCALE 1/2" = 1'-0"

PLAN
SCALE 1/8" = 1'-0"

DETAIL "A"
SCALE 1 1/2" = 1'-0"

DETAIL "B"
SCALE 1 1/2" = 1'-0"

DETAIL "C"
SCALE 1 1/2" = 1'-0"

PLAN

SECTION

TYPICAL BRACKET FOR POLE LIGHT
SCALE 1" = 1'-0"

CHAIN
SCALE 1 1/2" = 1'-0"

PLAN
SCALE 1 1/2" = 1'-0"

SECTION T-T
SCALE 1" = 1'-0"

PAVEMENT DRAIN DETAILS

NOTE:
For General Notes see Sheet No. 90

SECTION Z-Z
SCALE 1" = 1'-0"

SECTION Y-Y
SCALE 1" = 1'-0"

SECTION A-A
SCALE 1/2" = 1'-0"

SECTION X-X
SCALE 1" = 1'-0"

SECTION W-W
SCALE 1" = 1'-0"

PAYMENT ITEM NUMBERS
Concrete for bridge superstructure Item No. 61
Steel reinforcement Item No. 64
Pavement drains Item No. 73
Structural steel Item No. 75
Bridge railings Item No. 77

GRAPHIC SCALES

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY J.S.M. | DR. BY J.P.H. | CK. BY

SUBMITTED
CHIEF, STRUCT. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SERVICE BRIDGE
STRUCTURAL STEEL DETAILS NO. 1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

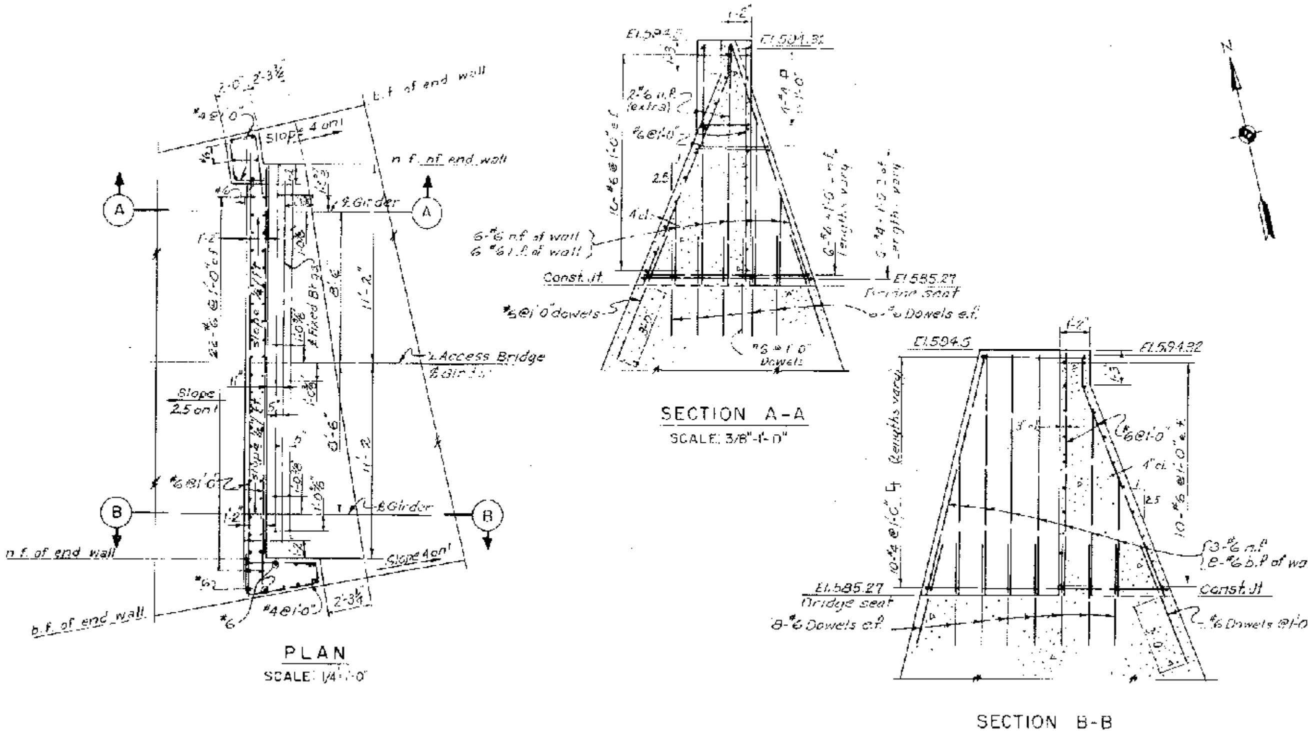
APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

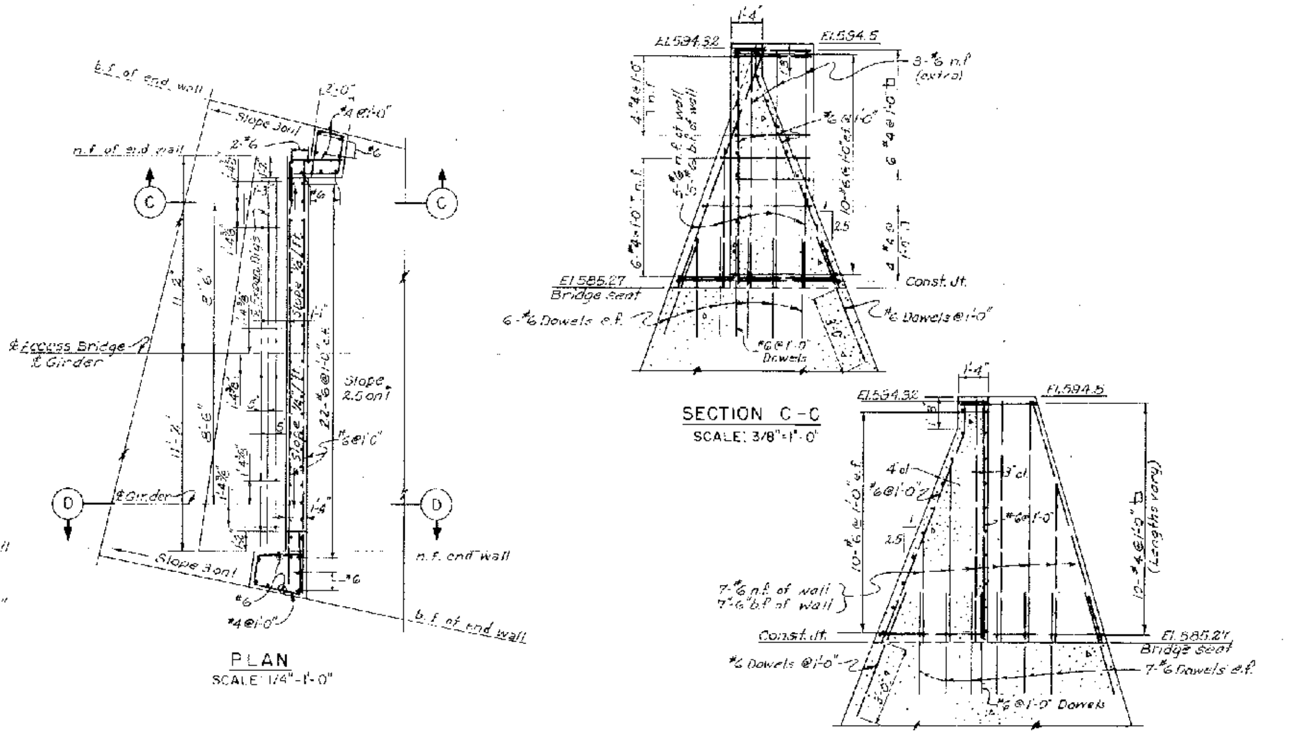
SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5797
SHEET 91

CORPS OF ENGINEERS

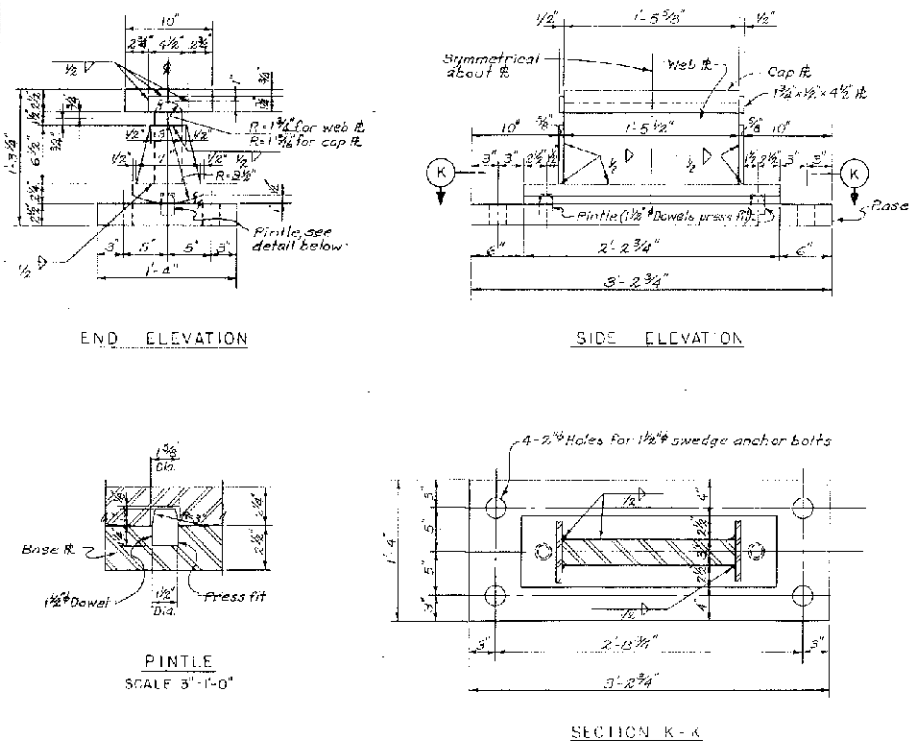
U. S. ARMY



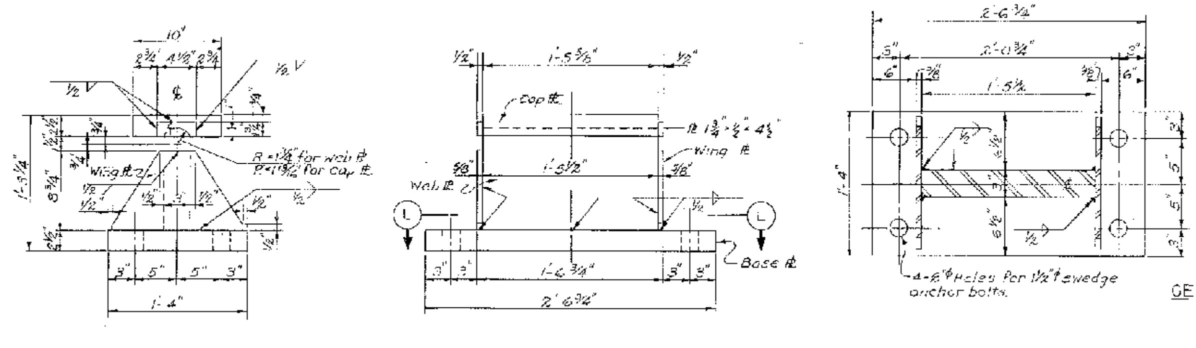
ACCESS BRIDGE
WEST ABUTMENT DETAILS



ACCESS BRIDGE
EAST ABUTMENT DETAILS



EXPANSION BEARING DETAILS
SCALE 1½"=1'-0"



FIXED BEARING DETAILS
SCALE 1½"=1'-0"

NOTES:

All anchor bolts shall be 1½" Swedged type and embedded 1'-6" in concrete.
Bridge bearings shall be fabricated from structural steel.

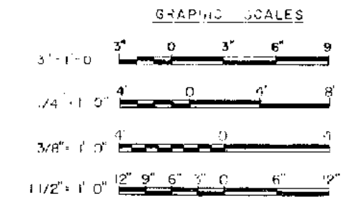
GENERAL NOTES:

Elevations refer to Mean Sea Level Datum
Bar splices shall lap 30 diams. of the smaller bar
Minimum cover for main reinforcement shall be 3" except as noted otherwise
All flange plates shall be U.M. plate
Holes and bolts for erection of cross frames may be used.
Contractor shall submit details of supports for the girders during field or shop splicing operations to insure proper camber is maintained.

PAYMENT ITEM NUMBERS

Concrete in Access Bridge Abutments Item No. 48
Concrete in bridge superstructure Item No. 61
Steel reinforcement Item No. 64
Structural steel in Access Bridge, except pavement drains, Item No. 76
Pavement drains Item No. 73.
Aluminum railings Item No. 77.

REVISION	DATE	DESCRIPTION	BY



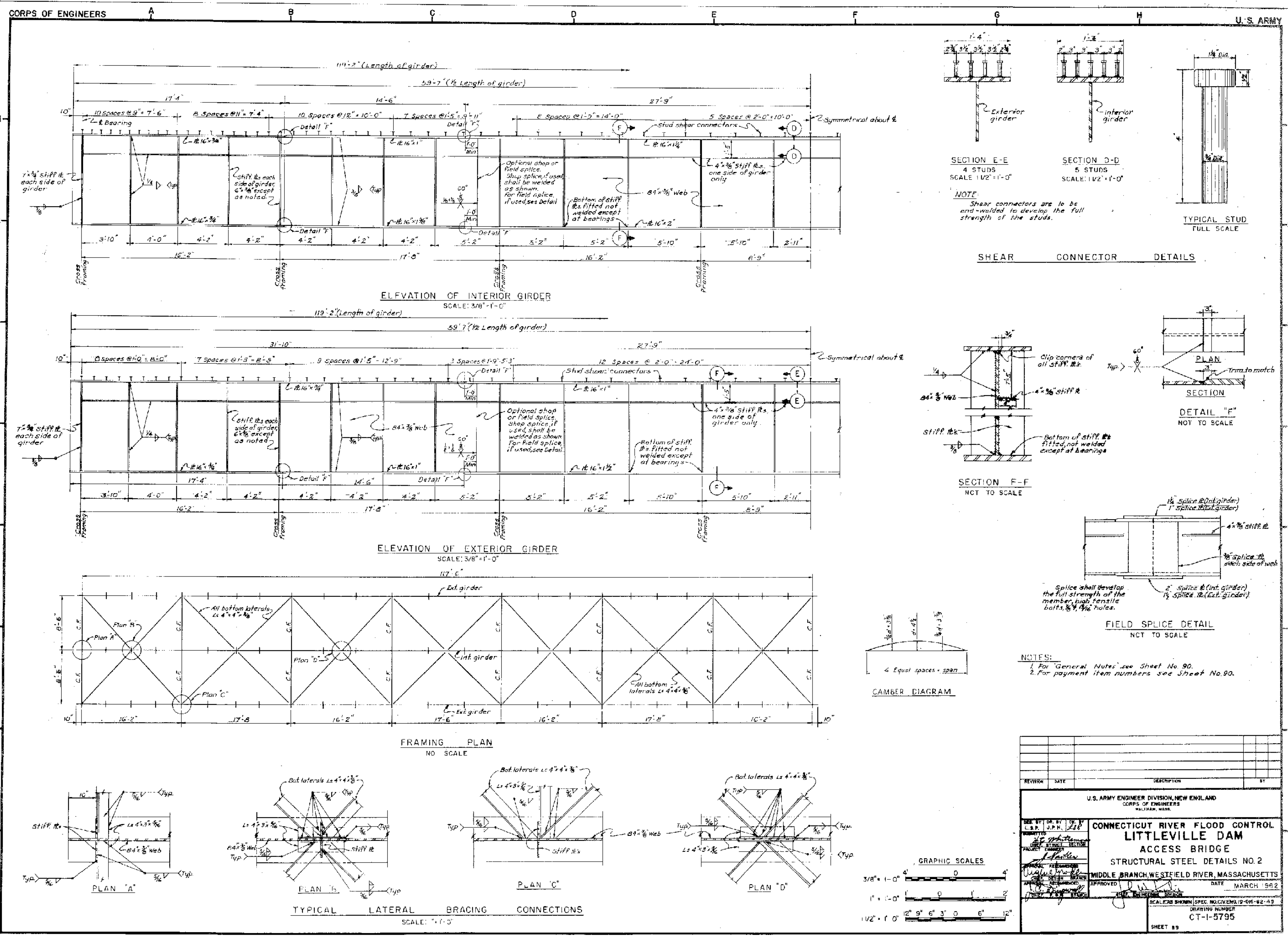
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.S.P. DR. BY J.P.H. CK. BY
SUBMITTED H. E. Whittemore CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ACCESS AND SERVICE BRIDGES
STRUCTURAL
BEARING AND ABUTMENT DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5796
SHEET 90



SHEAR CONNECTOR DETAILS

NOTE:
Shear connectors are to be end-welded to develop the full strength of the studs.

Optional shop or field splice. Shop splice, if used, shall be welded as shown. For field splice, if used, see Detail.

Stiff. ℞s each side of girder, 6"×⅜" except as noted.

Splice shall develop the full strength of the member, high tensile bolts, ⅞" Φ, 15/16" holes.

NOTES:
1. For General Notes see Sheet No. 90.
2. For payment item numbers see Sheet No. 90.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.S.P. | DR. BY J.P.H. | CK. BY

SUBMITTED H. G. Whittemore
CHIEF, STRUCT. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

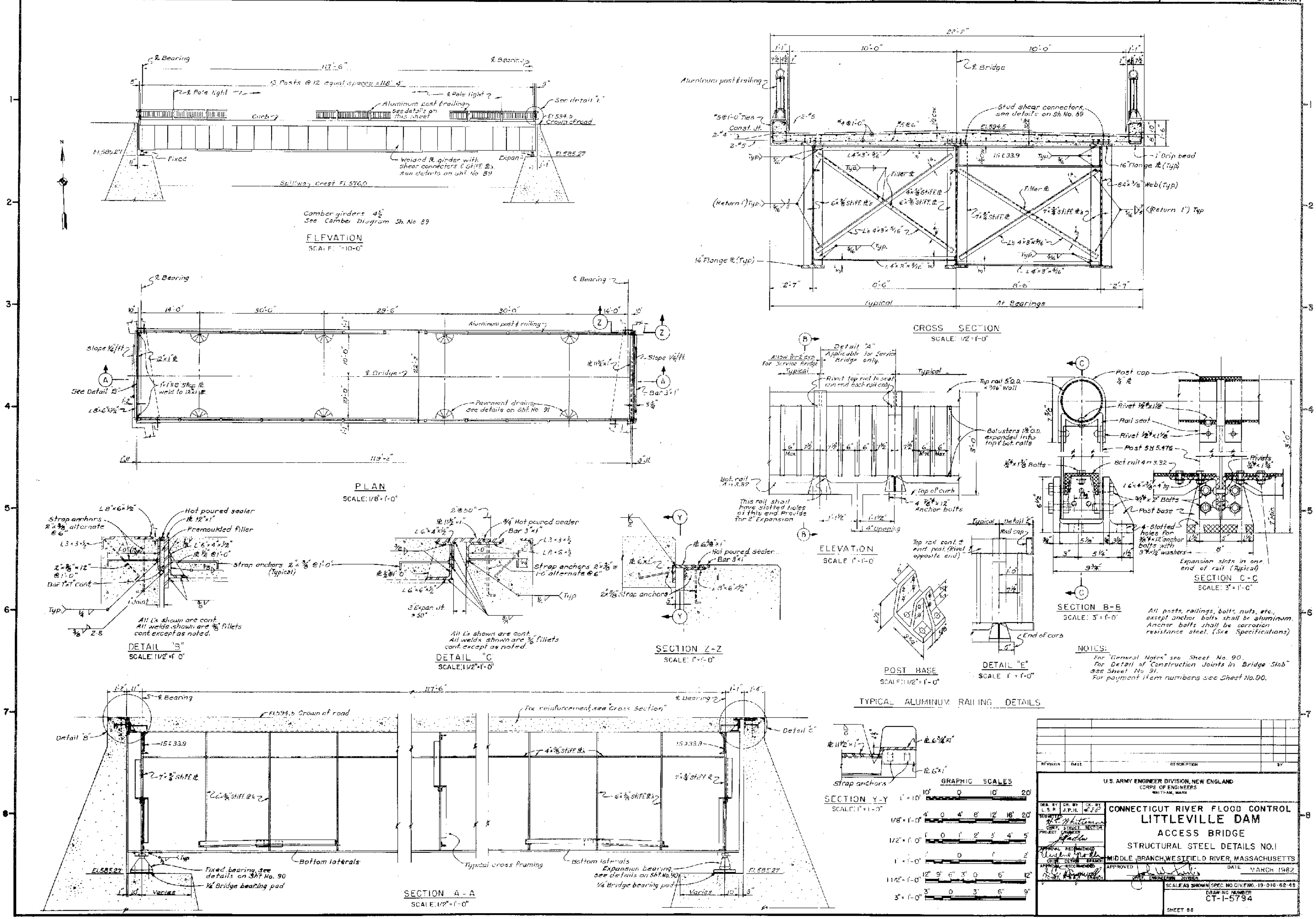
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ACCESS BRIDGE
STRUCTURAL STEEL DETAILS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN | SPEC. NO. CIVENG 19-016-62-49
DRAWING NUMBER
CT-1-5795
SHEET 89

CORPS OF ENGINEERS

U. S. ARMY



All posts, railings, bolts, nuts, etc., except anchor bolts shall be aluminum. Anchor bolts shall be corrosion resistance steel. (See Specifications)

NOTES:

For "General Notes" see Sheet No. 90.

For Detail of "Construction Joints in Bridge Slab" see Sheet No. 91.

For payment item numbers see Sheet No. 90.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY L.S.P. | DR. BY J.P.H. | CK. BY

SUBMITTED
CHIEF, STRUCT. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ACCESS BRIDGE
STRUCTURAL STEEL DETAILS NO.1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

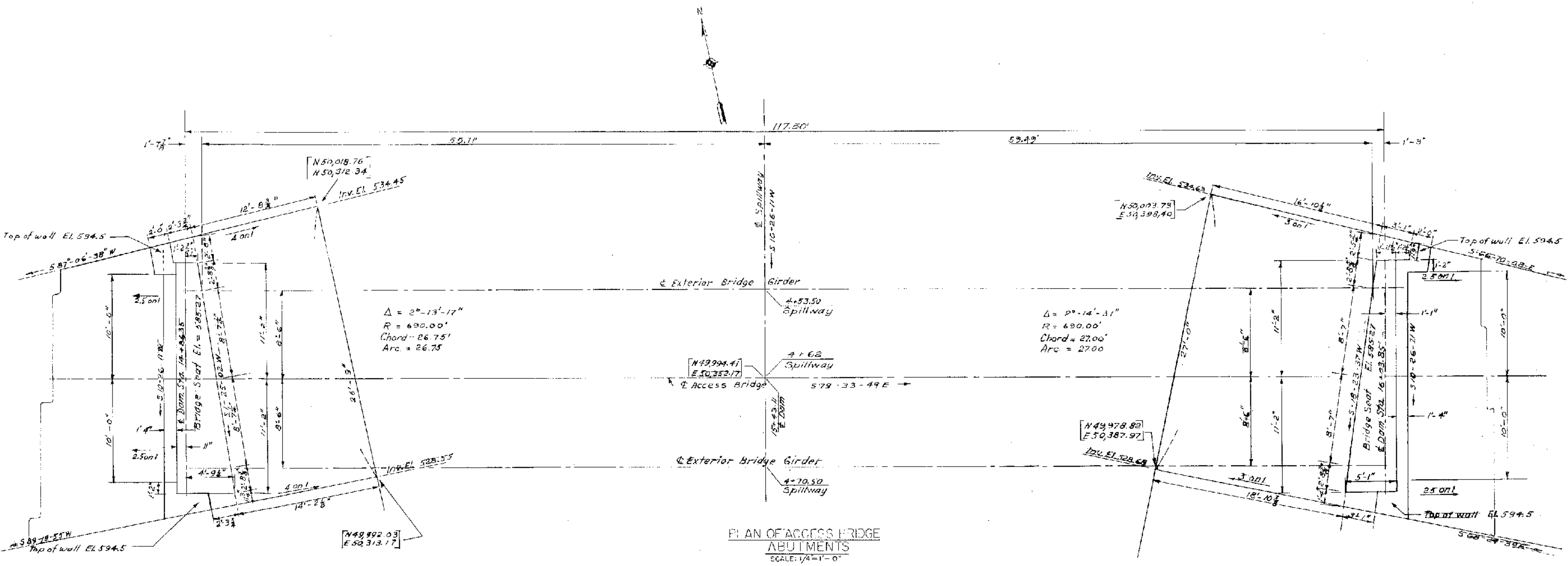
SCALE: AS SHOWN | SPEC. NO. CIVENG.-19-016-62-49

DRAWING NUMBER
CT-1-5794

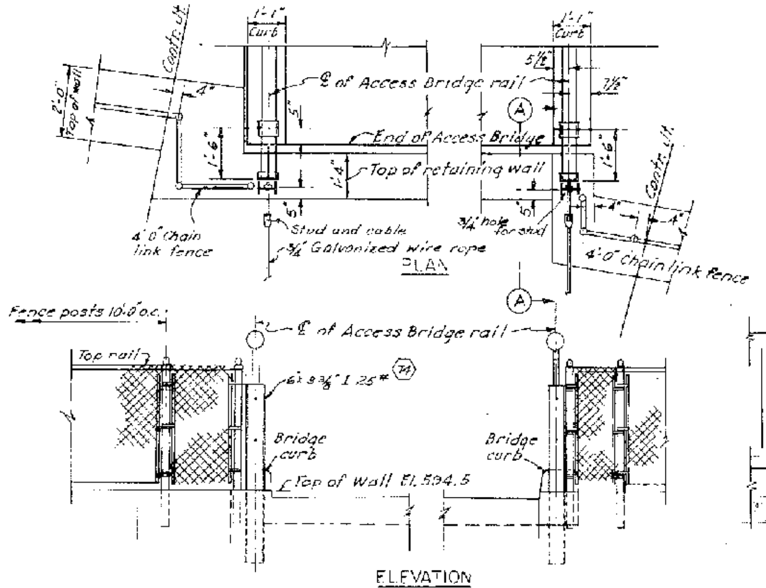
SHEET 88

CORPS OF ENGINEERS

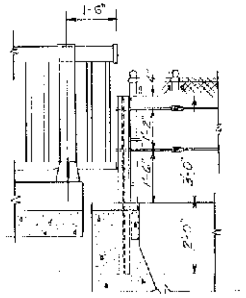
U. S. ARMY



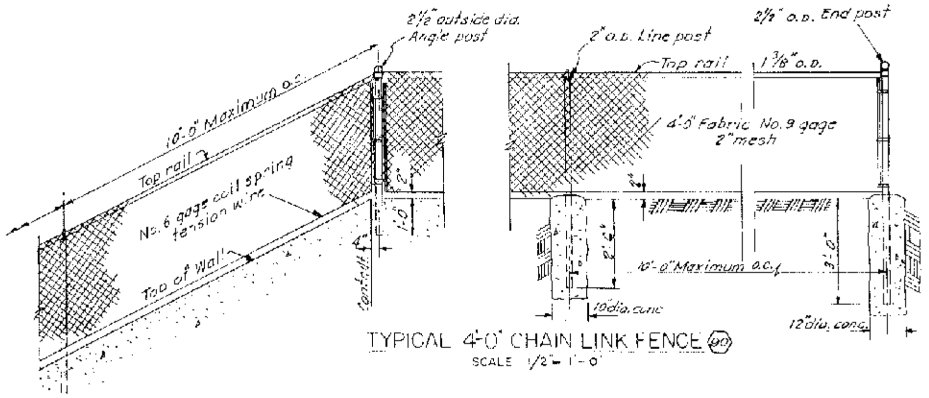
PLAN OF ACCESS BRIDGE ABUTMENTS
SCALE: 1/4"=1'-0"



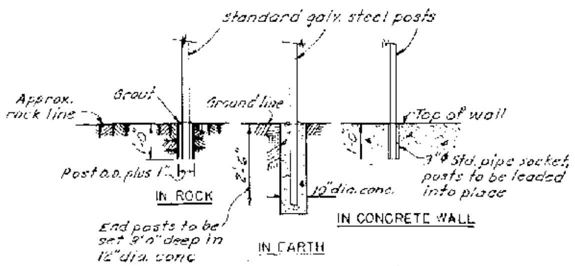
DETAIL OF CHAIN LINK FENCE AT SPILLWAY RETAINING WALLS
SCALE: ½" = 1'-0"



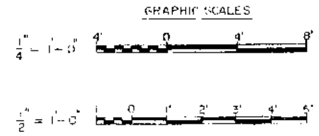
SECTION A-A



TYPICAL 4'-0" CHAIN LINK FENCE (90)
SCALE ½" = 1'-0"


standard galv. steel posts
Approx. rock line
Grout
1'-0"
Post o.d. plus 1"
IN ROCK
Ground line
2'-6"
10" dia. conc.
End posts to be set 3'-0" deep in 12" dia. conc.
IN EARTH
Top of wall
1'-0"
3"φ Std. pipe socket, posts to be leaded into place
IN CONCRETE WALL

TYPICAL FOOTINGS
SCALE: ½" = 1'-0"



NOTES

Elevations refer to Mean Sea Level Datum.

Figures in hexagons indicate Item Nos. under which payment will be made.

For structural joint details Sheet No. 34.

For Steel reinforcement see Sheet No. 90.

Concrete for access bridge abutments will be paid for under Item No. 48.

Concrete lining shown on this sheet will be paid for under Item No. 46.

For sections thru abutments see Sheets Nos. 35 & 37.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY C.J.B. | DR. BY J.T.D. | CK. BY R.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, [illegible] BRANCH

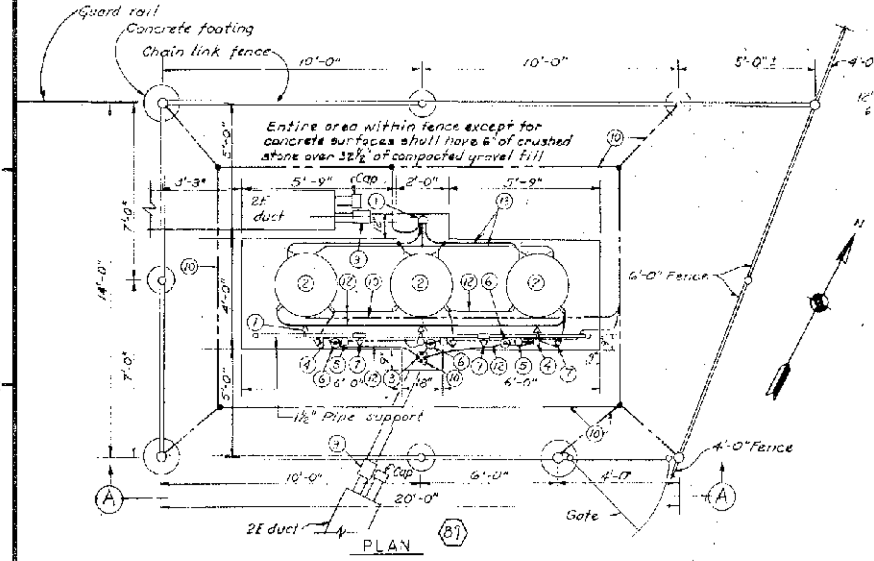
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ACCESS BRIDGE ABUTMENTS
PLAN AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

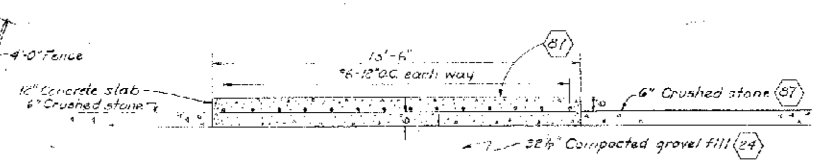
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5793
SHEET 87

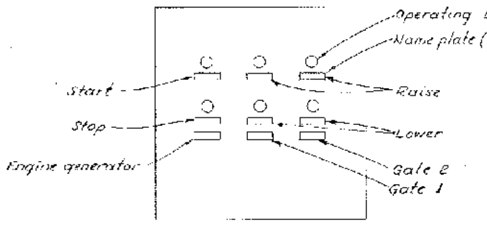
CORPS OF ENGINEERS U. S. ARMY



PLAN ⟨81⟩

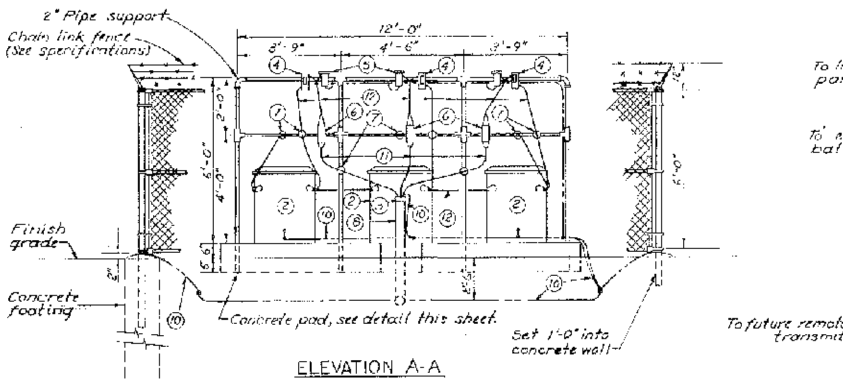


TRANSFORMER PAD DETAIL
NO SCALE

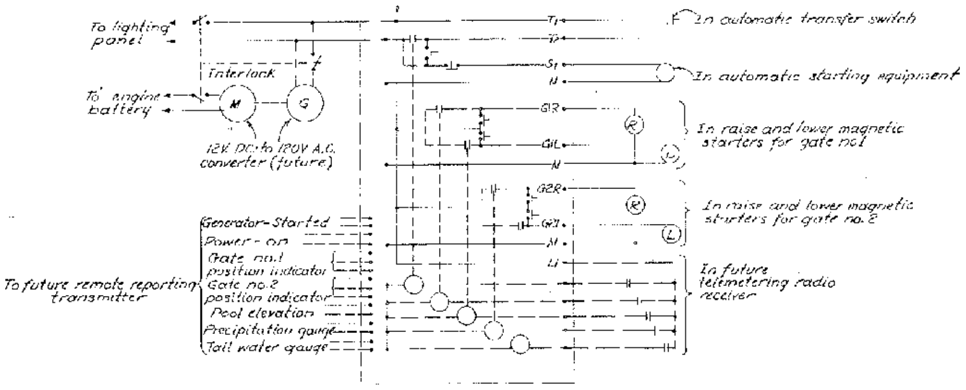


REMOTE CONTROL PANEL ⟨82⟩
SCALE 1/2" = 1'-0"

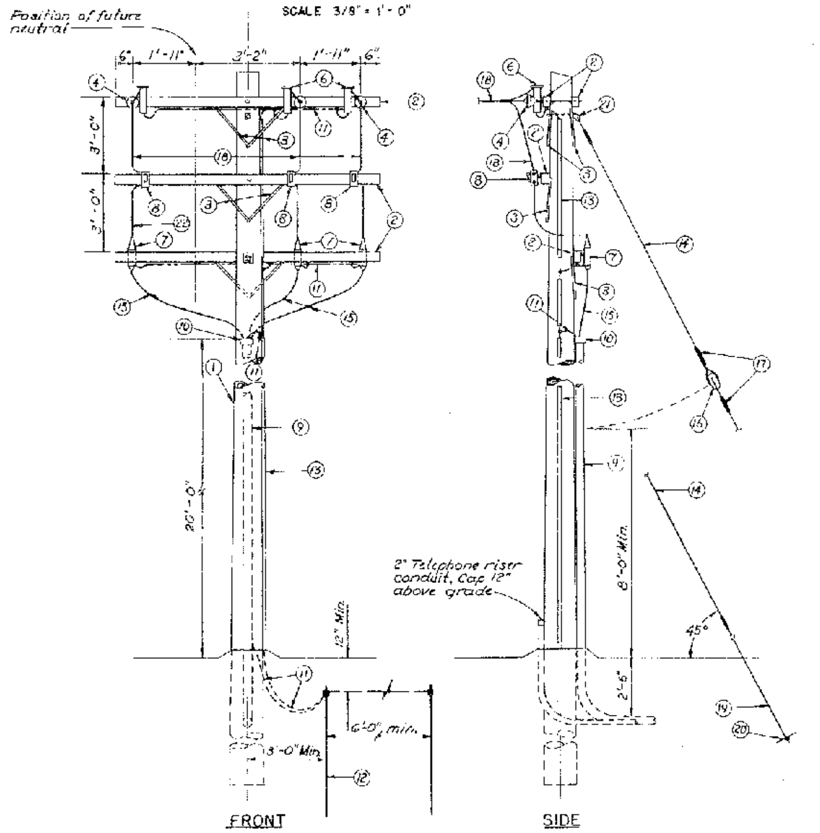
REMOTE CONTROL WIRING DIAG. LEGEND	
SYMBOL	DESCRIPTION
⊣⊢	Relay contact
⊥	Start button
⊥	Stop button
○	Relay coil
———	Wiring by this contractor
– – –	Future wiring and equipment


2" Pipe support
Chain link fence (See specifications)
12'-0"
3'-9"
4'-6"
3'-9"
Finish grade
Concrete footing
Concrete pad, see detail this sheet.
Set 1'-0" into concrete wall
2'-0"
4'-0"
6'-0"
5'-0"

ELEVATION A-A
THREE PHASE TRANSFORMER STATION
SCALE 3/8" = 1'-0"


To lighting panel
To engine battery
Interlock
M
G
12V. DC to 120V A.C. converter (future)
T1
T2
S1
N
G1R
G1L
N
G2R
G2L
N
L1
R
L
In automatic transfer switch
In automatic starting equipment
In raise and lower magnetic starters for gate no.1
In raise and lower magnetic starters for gate no.2
In future telemetering radio receiver
To future remote reporting transmitter
Generator-Started
Power-on
Gate no.1 position indicator
Gate no.2 position indicator
Pool elevation
Precipitation gauge
Tail water gauge

REMOTE CONTOL PANEL
WIRING DIAGRAM



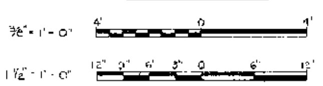
RISER POLE DETAIL
SCALE 3/8" = 1'-0"

ITEM	MATERIAL SCHEDULE FOR TRANSFORMER STATION DESCRIPTION
①	2½" Weather head
②	Transformer - 25 KVA., 1 phase, ~~2400/4160Y - 240/480~~ connected 2400 - 480V
③	4" Cable support
④	Enclosed fuse cutout non-indicating, drop out type, 7.8KV 100A., 3000A. interrupting capacity.
⑤	Lightning arrester - 3KV.
⑥	Single conductor pothead 15 Kv outdoor type with cap nut & stuffing box for termination of #4 copper 5KV shielded cable.
⑦	Pin type insulator - 15 KV. with steel pin NEMA-EEI class-55-4
⑧	4" Steel conduit, galvanized.
⑨	2½"C to 4"F reducer and adapter
⑩	No. 6 stranded bare, copper ground wire.
⑪	No. 4 copper cable with ozone resistant insulation for 15KV metallic shield & neoprene jacket.
⑫	Same as item 11, except unshielded.
⑬	No. 2 copper cable, 600V

ITEM	MATERIAL SCHEDULE FOR RISER POLE DESCRIPTION
①	35 Foot class 3 pole.
②	Single wood cross arm - 3¾" x 4¾" x 8' long.
③	Flat steel crossarm brace - 1¼" x ¼" x 2'-2" long.
④	Dead end suspension insulator, clevis type NEMA-EEI class-52-4
⑤	Pin type insulator - 15KV with steel pin NEMA-EEI class-55-4
⑥	Lightning arrester - 3KV.
⑦	Single conductor pothead 15KV outdoor type with capnut & stuffing box for termination of no.4 copper conductor 15KV shielded cable
⑧	Enclosed fuse cutout indicating non drop out type 7.8KV 100A., 3000A. interupting capacity.
⑨	4" Steel conduit, galvanized.
⑩	4" Cable support
⑪	No. 6 stranded bare copper ground wire.
⑫	¾" Dia. x 10'-0" long copper clad ground rod.
⑬	Ground moulding
⑭	⅜" Dia. steel galvanized utility grade guy wire, 7 strand.
⑮	No. 4 copper cable with ozone resistant insulation for 15KV Metallic shield & neoprene jacket.
⑯	Porcelain strain insulator NEMA EEI class-54-2
⑰	Preformed guy grip
⑱	No. 6 stranded bare copper
⑲	Anchor rod - ¾" Dia. x 10'-0" long
⑳	Plate anchor for sand.
㉑	¾" Dia. angle eye bolt with lift plate and curved washer.
㉒	Same as item 15 except unshielded

NOTE-
Figures in hexagons indicate Item Nos. under which payment will be made.

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

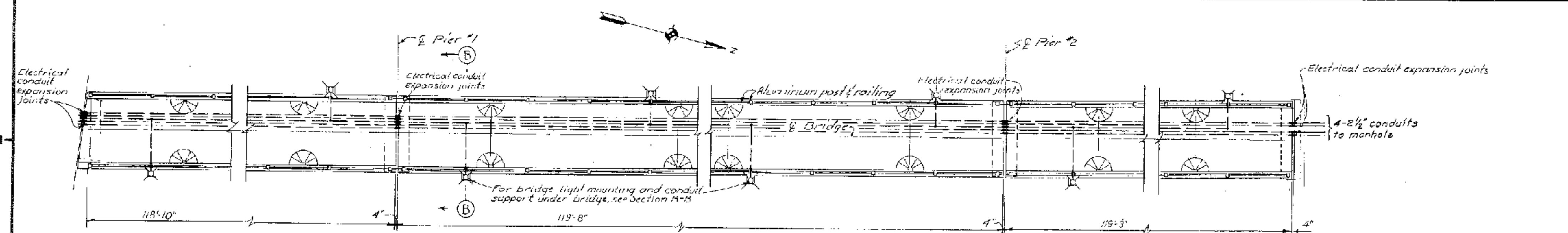
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.I.D. DR. BY J.G.M. CK. BY
SUBMITTED: CHIEF, ELECT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED: CHIEF, F. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ELECTRICAL DISTRIBUTION SYSTEM
MISCELLANEOUS DETAILS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED: CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

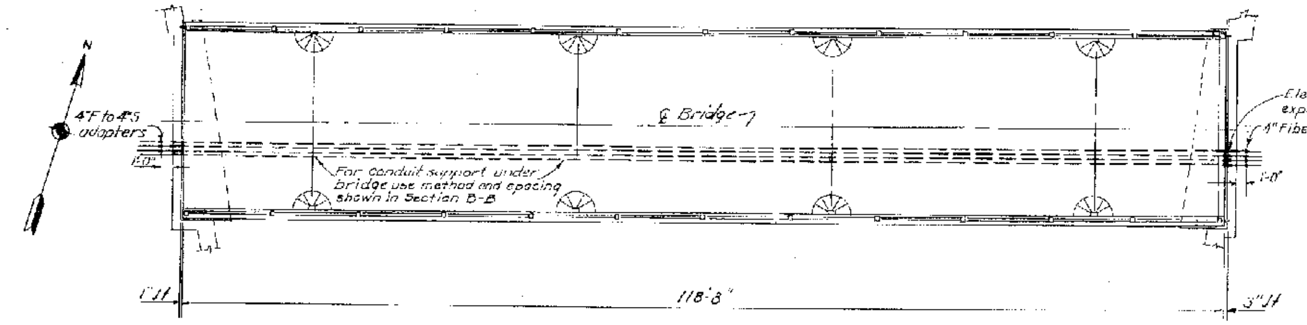
SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5792
SHEET 66



Electrical conduit expansion joints
℄ Pier #1
B
Electrical conduit expansion joints
Aluminum post & railing
Electrical conduit expansion joints
℄ Bridge
℄ Pier #2
Electrical conduit expansion joints
4-2½" conduits to manhole
For bridge light mounting and conduit support under bridge, see Section B-B
B
118'-10"
4'
119'-8"
4'
119'-3"
4'

PLAN - SERVICE BRIDGE

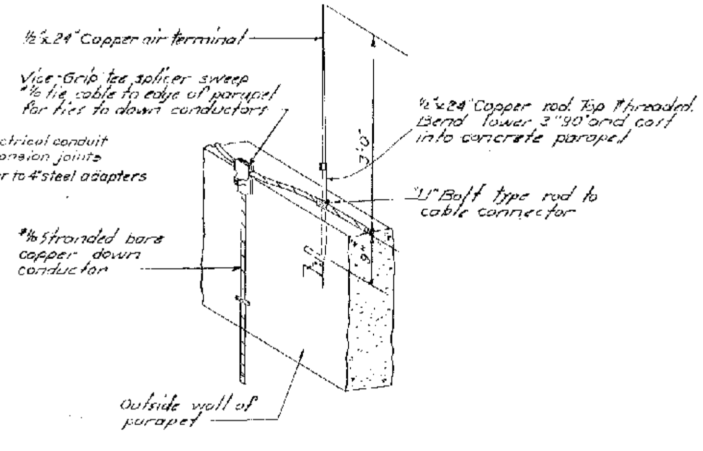
SCALE 1/8"=1'-0"



4"F to 4"S adapters
℄ Bridge
For conduit support under bridge use method and spacing shown in Section B-B
Electrical conduit expansion joints
4" Fiber to 4" steel adapters
1'-0"
118'-8"
3'-14

PLAN ACCESS BRIDGE

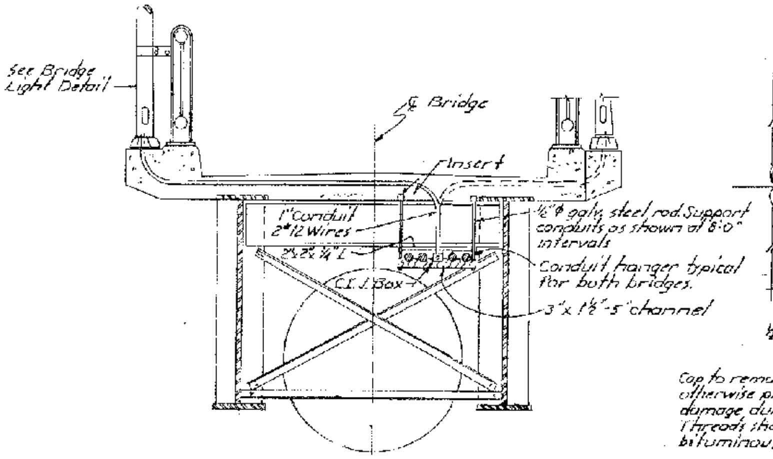
SCALE 1/8"=1'-0"



½"x24" Copper air terminal
Vice-Grip tee splicer sweep #6 tie cable to edge of parapet for ties to down conductors
½"x24" Copper rod. Top threaded. Bend lower 3" 90° and cast into concrete parapet
3'-0"
"U" Bolt type rod to cable connector
#6 Stranded bare copper down conductor
Outside wall of parapet

AIR TERMINAL MOUNTING DETAIL

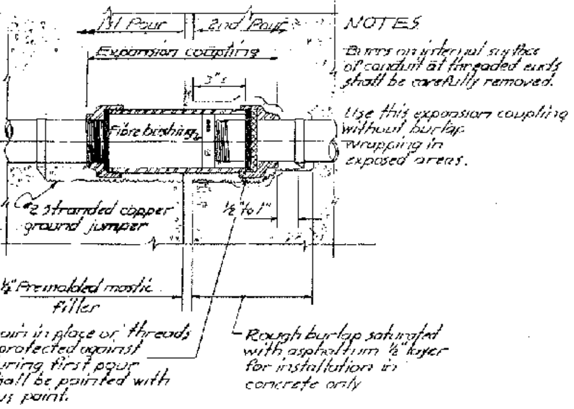
NOT TO SCALE



See Bridge Light Detail
℄ Bridge
Insert
1" Conduit 2 #12 Wires
½"φ galv. steel rod. Support conduits as shown at 8'-0" intervals
Conduit hanger typical for both bridges.
C.I. Box
3"x1½"-5 channel

SECTION B-B

SCALE 1/2"=1'-0"



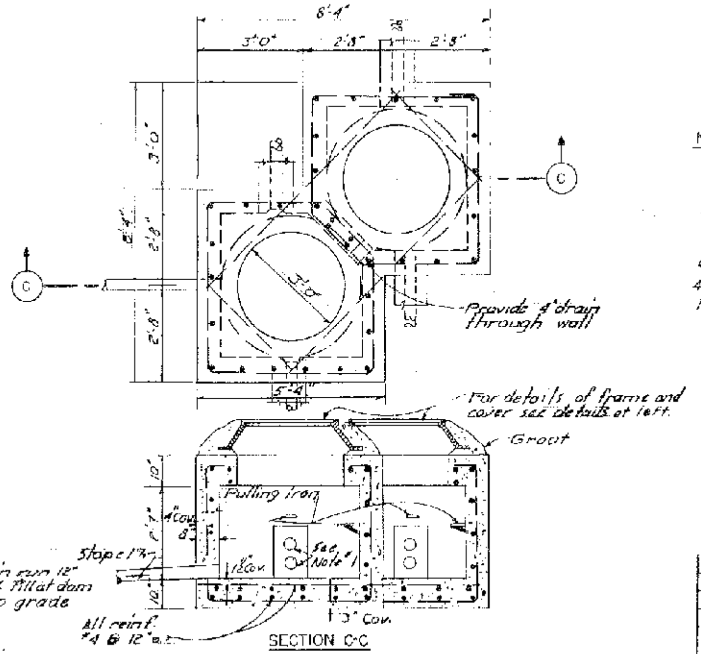
1st Pour
2nd Pour
Expansion coupling
Fibre bushing
#2 stranded copper ground jumper
½" to 1"
½" Premolded mastic filler
Cap to remain in place or threads otherwise protected against damage during first pour. Threads shall be painted with bituminous paint.
Rough burlap saturated with asphaltum ½" layer for installation in concrete only

NOTES

Burrs on internal surface of conduit at threaded ends shall be carefully removed.

Use this expansion coupling without burlap wrapping in exposed areas.

DETAIL OF EXPANSION JOINT FITTING
FOR ELECTRICAL CONDUITS



8'-4"
3'-0"
2'-8"
2'-8"
3'-0"
2'-8"
3'-0"
C
C
Provide 4" drain through wall
For details of frame and cover see details at left.
Grout
Pulling iron
See Note 1
Box
Slope 1"
4" V.C. drain run 12" into rock fill at dam or out to grade
All reinf. #4 @ 12" c.c.
3" Cov.

SECTION C-C
DOUBLE MANHOLE DETAIL

SCALE 1/2"=1'-0"

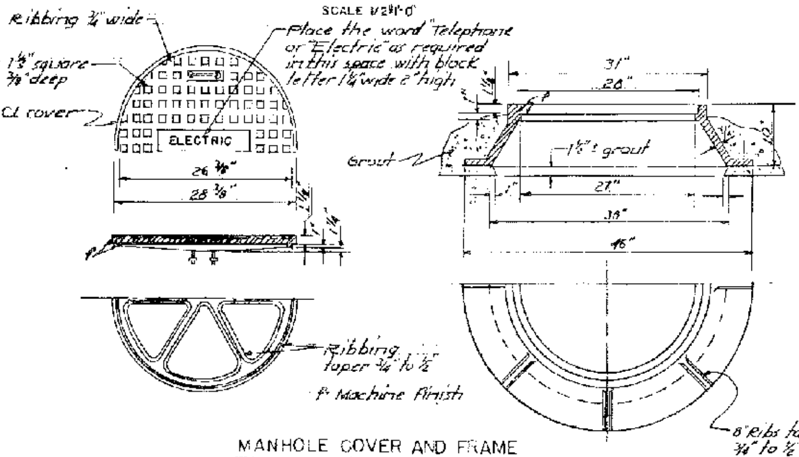
NOTES

Install end bells on all ducts entering manholes.

Install expansion coupling in each conduit crossing at each expansion joint in bridge.

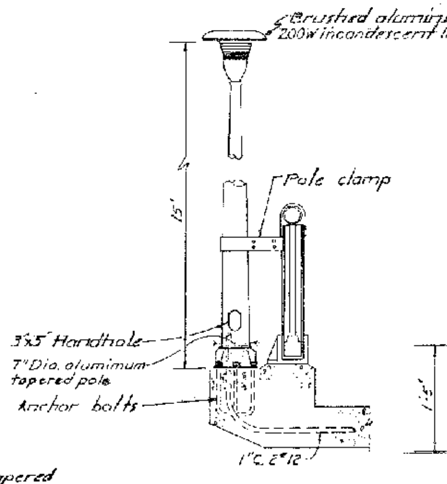
Manhole pipe drain shall conform to Section 38 of the Specifications.

4 Exterior electrical work shown on this sheet will be paid for under Item 87.



MANHOLE COVER AND FRAME

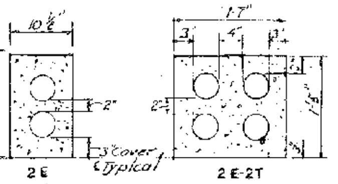
SCALE 1"=1'-0"



Brushed aluminum 200W incandescent light
15'
Pole clamp
3"x5" Handhole
7" Dia. aluminum tapered pole
Anchor bolts
1" C. 2 #12

TYPICAL BRIDGE LIGHT DETAIL

SCALE 3/4"=1'-0"



TYPICAL DUCT SECTIONS

SCALE 1"=1'-0"

GRAPHIC SCALES

1/8" = 1'-0"
1/2" = 1'-0"
3/4" = 1'-0"
1" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.A.D.	DR. BY R.B.P.	CK. BY

SUBMITTED
CHIEF, ELECT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ELECTRICAL DISTRIBUTION SYSTEM
MISCELLANEOUS DETAILS NO. 1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

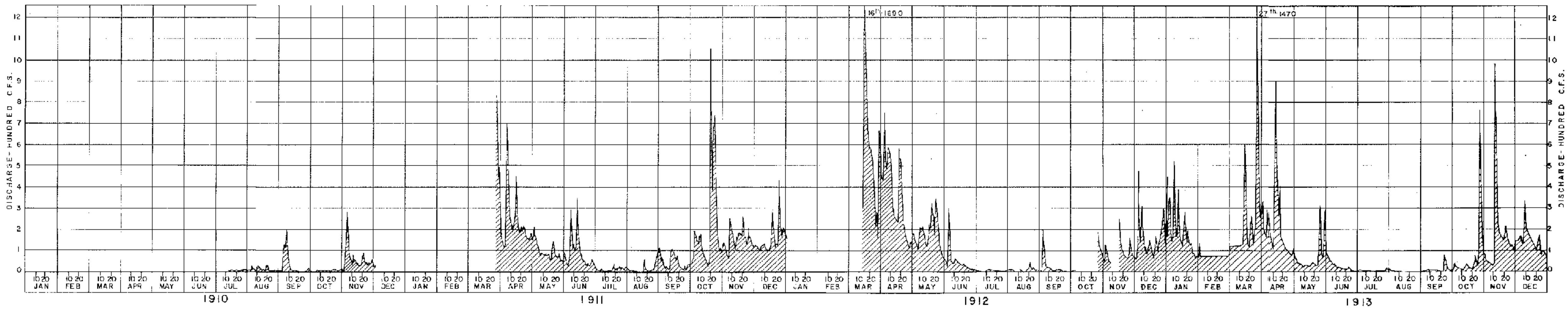
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

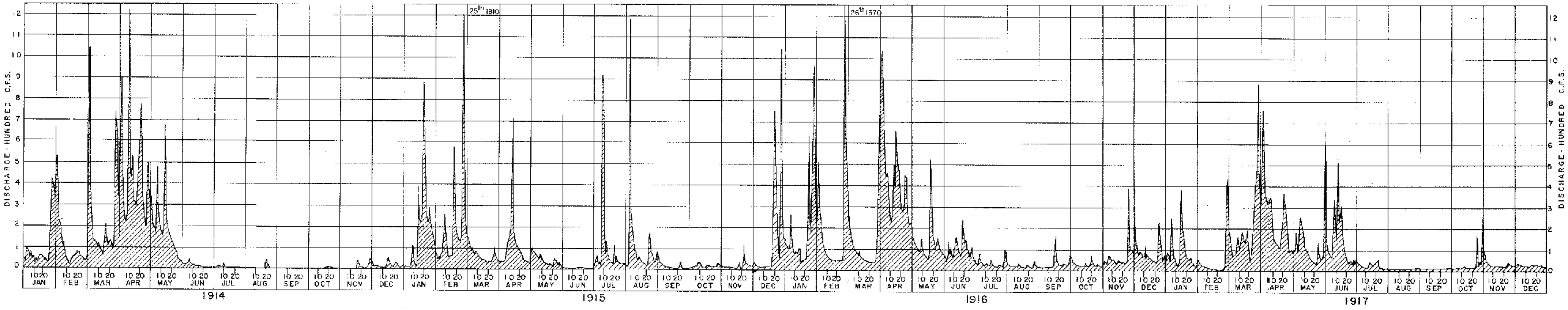
SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5791

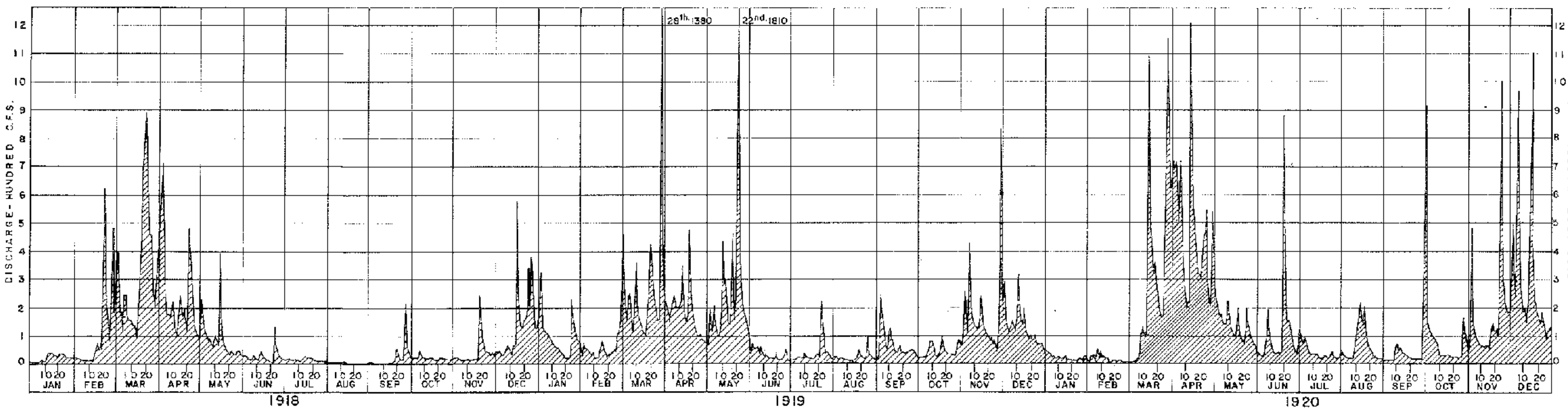
SHEET 85

CORPS OF ENGINEERS

U. S. ARMY







NOTES

1. These hydrographs are the daily average stream flow record of Middle Branch Westfield River, Goss Heights, Massachusetts from the tributary drainage area of 52.6 Square Miles.

2. Instantaneous peak discharges are shown where available.

3. The data contained herein are not intended as representations or warrantees but are furnished for information only. It is expressly understood that the government will not be responsible for any deductions, interpretations or conclusions therefrom made by any bidder or contractor.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY
R.J.B.		E.P.S.

SUBMITTED C. F. Cl[illegible]
CHIEF, HYD & HYD. SECTION

PROJECT ENGINEER J. Har[illegible]

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE RESERVOIR
HYDROGRAPHS NO. I

MIDDLE BRANCH WESTFIELD RIVER, MASS.

APPROVAL RECOMMENDED [illegible]
CHIEF P.S. & R. BRANCH

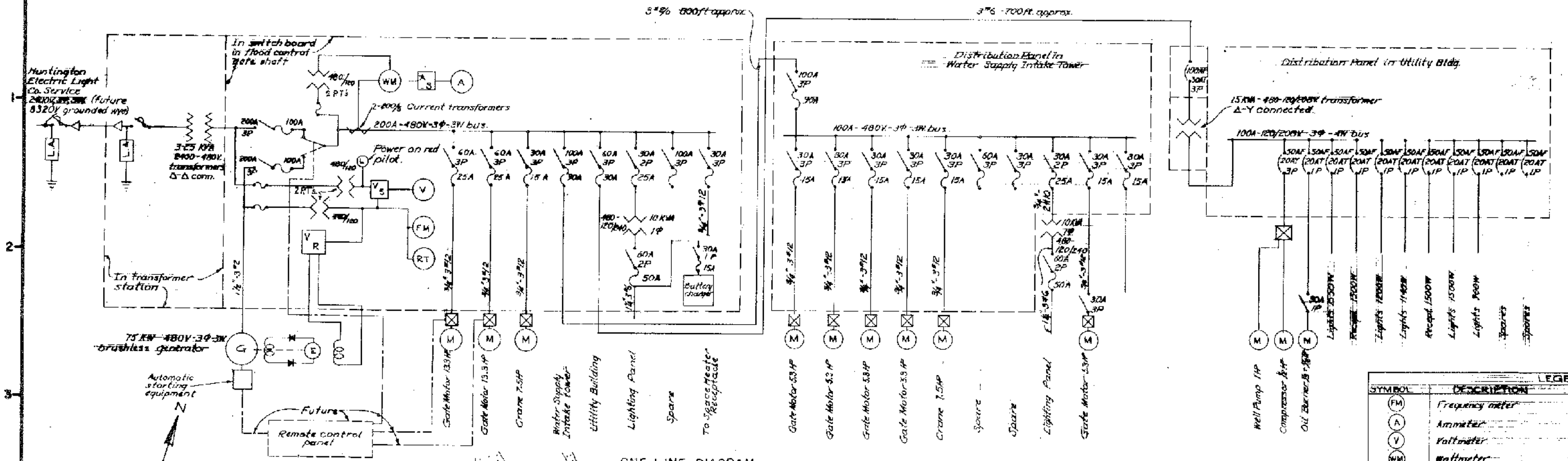
APPROVED J. W. [illegible]
CHIEF ENGINEERING DIVISION

DATE 1 APR 1962

SCALE AS SHOWN | SPEC NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5726

SHEET 3



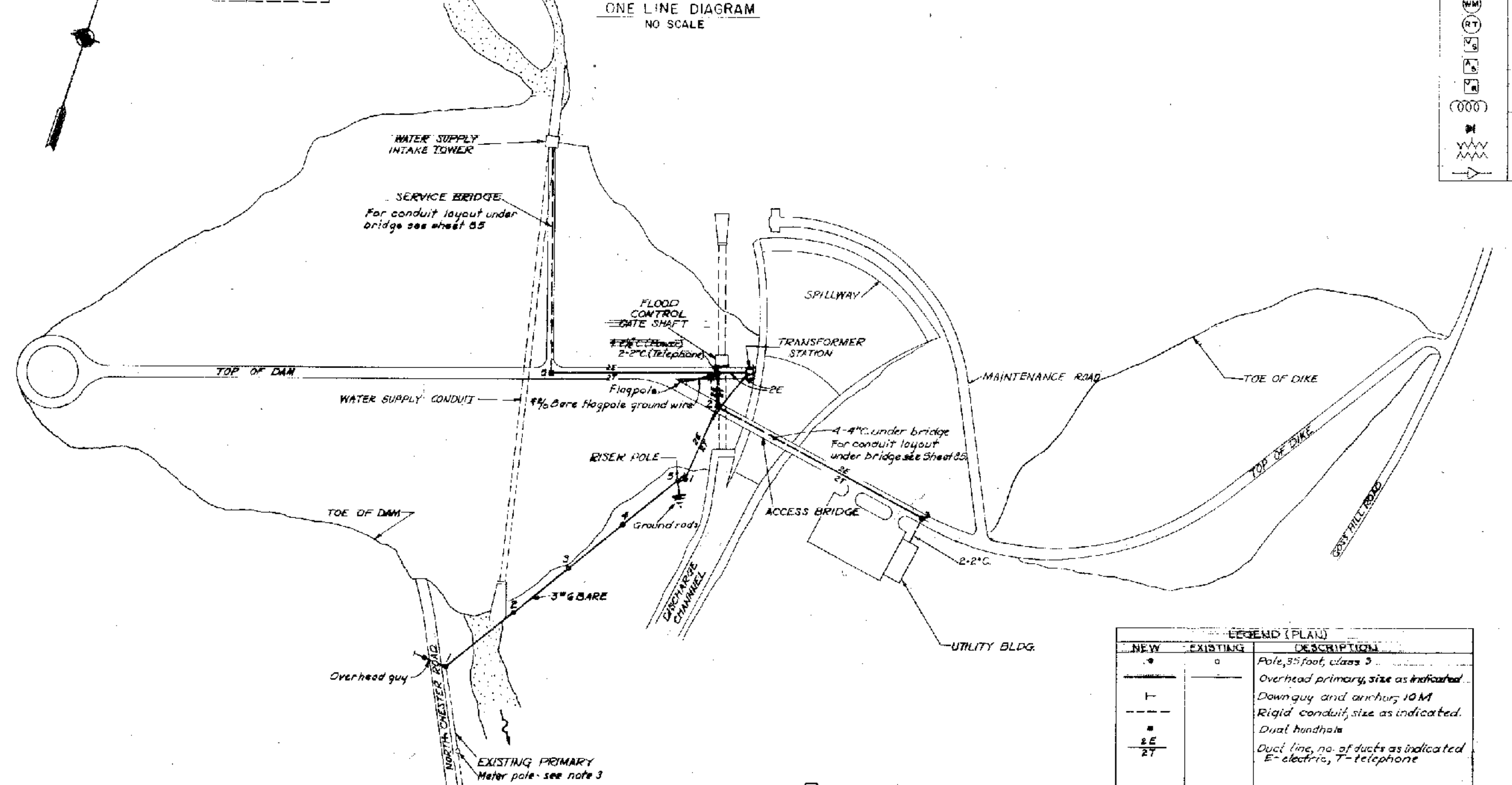
ONE LINE DIAGRAM

NO SCALE

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
(FM)	Frequency meter	50AF 30AT 3P	Circuit breaker, No. of poles, trip and frame size as indicated.
(A)	Ammeter		Fused switch, No. of poles, switch size and fuse as indicated.
(V)	Voltmeter		Fused cutout
(WM)	Wattmeter	LA	Lightning arrestor
(RT)	Running time indicator	(G)	Generator
V_S	Voltmeter switch	(E)	Exciter
A_S	Ammeter switch	(M)	Motor
V_R	Voltage regulator	(L)	Pilot light
	Field coil	☒	Magnetic motor starter
	Rectifier		Automatic transfer switch
	Transformer	— — —	Remote control circuits
—▷	Pothead		

NOTES-

1. For transformer station and riser pole details see sheet 86.
2. For manhole details and duct sections see sheet 85.
3. Contractor shall install 24" high, 15" wide, 10" deep meter enclosure similar and equal to Anchor #2415D, 4'-0" above grade, and a 1" conduit riser up pole, terminating in a 4 conductor weatherhead 3'-0" below primary conductors. Wiring, metering transformers, and meter will be furnished and installed by utility company.
4. Figure in hexagon indicates Item No. under which payment will be made.



ELECTRICAL DISTRIBUTION PLAN ⑧⑦

SCALE 1" = 100'

LEGEND (PLAN)

NEW	EXISTING	DESCRIPTION
●	○	Pole, 35 foot, class 3
━━	——	Overhead primary, size as indicated
⊢		Downguy and anchor, 10M
- - - -		Rigid conduit, size as indicated.
■		Dual handhole
$\frac{2E}{2T}$		Duct line, no. of ducts as indicated E-electric, T-telephone

GRAPHIC SCALE

1" = 100'

100' 0 100' 200'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.A.D.
DR. BY J.S.M.
CK. BY

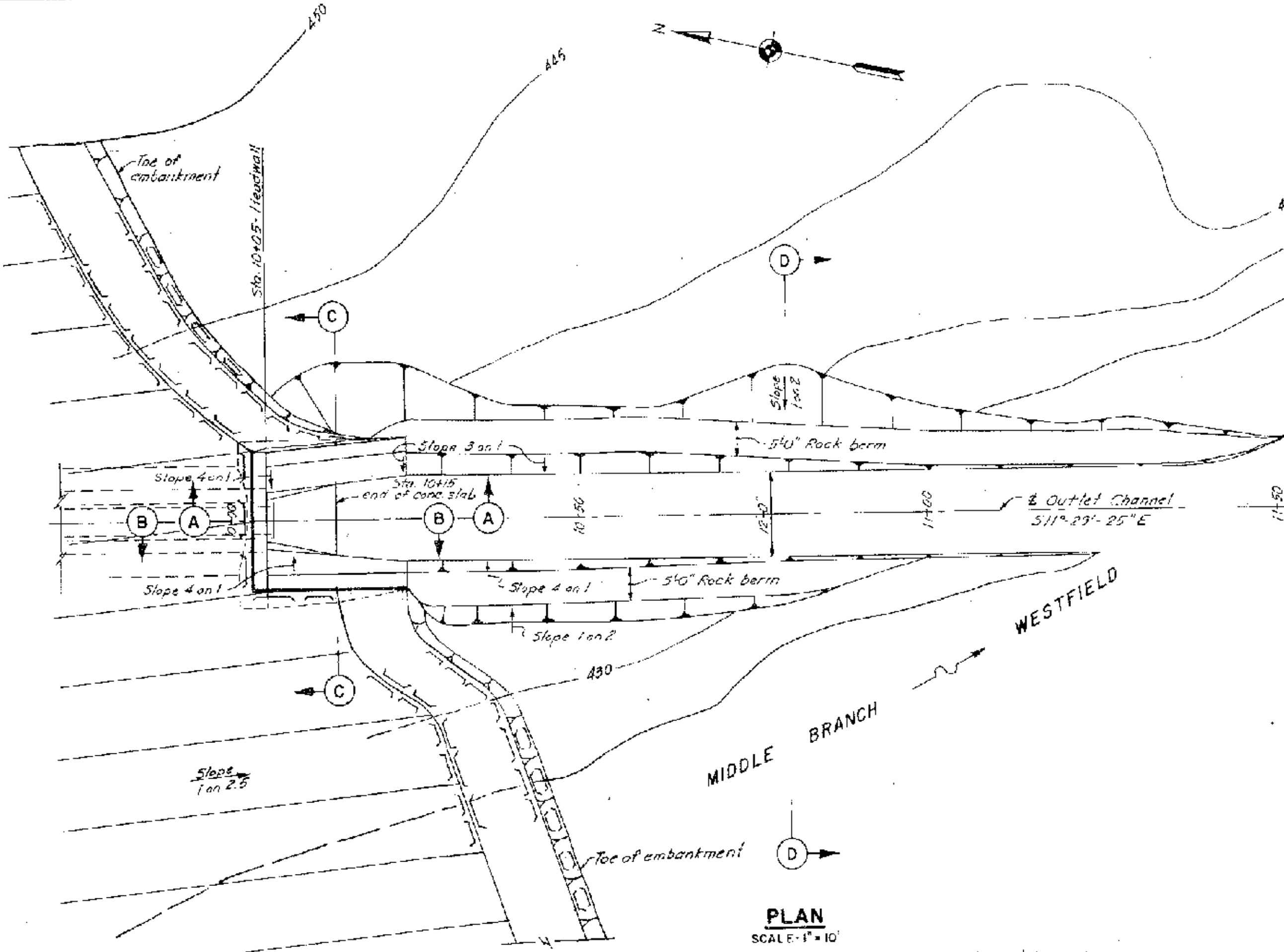
CHIEF, ELECT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED CHIEF, ENGINEERING BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ELECTRICAL DISTRIBUTION SYSTEM
PLAN AND ONE LINE DIAGRAM
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

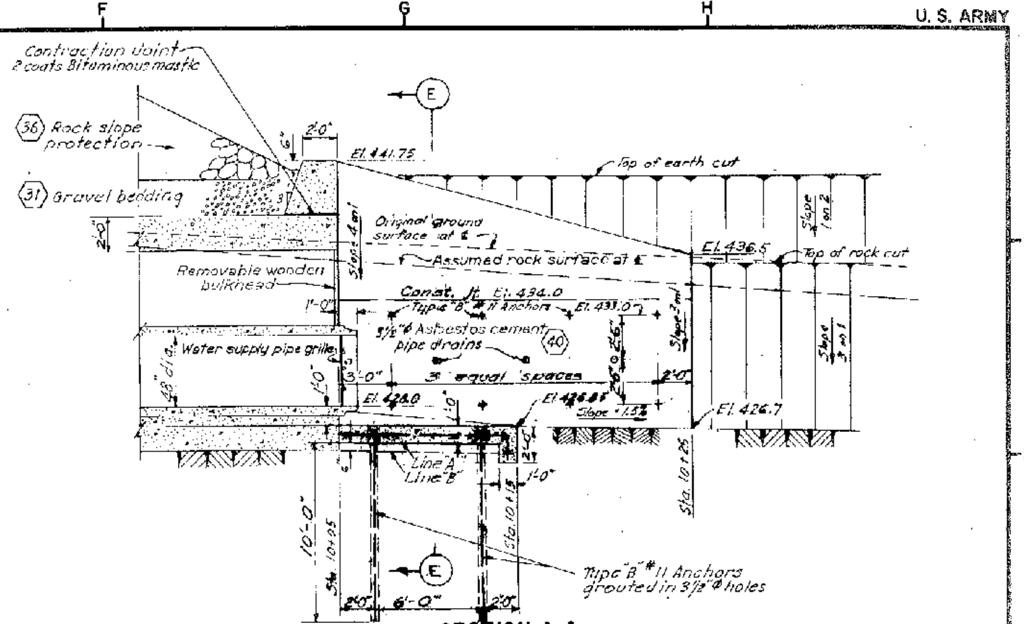
SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-48
DRAWING NUMBER
CT-1-5790
SHEET 84

CORPS OF ENGINEERS U. S. ARMY



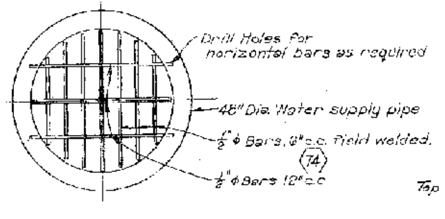
PLAN

SCALE - 1" = 10'



SECTION A-A

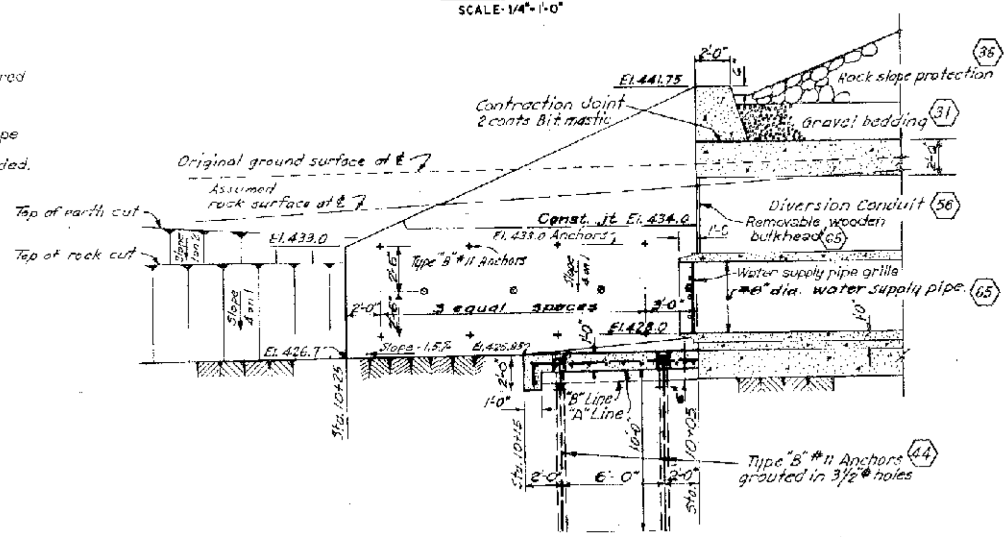
SCALE - 1/4" = 1'-0"



Drill Holes for horizontal bars as required
48" Dia. Water supply pipe
⅞"⌀ Bars, 9" c.c. Field welded. (74)
⅞"⌀ Bars 10" c.c.

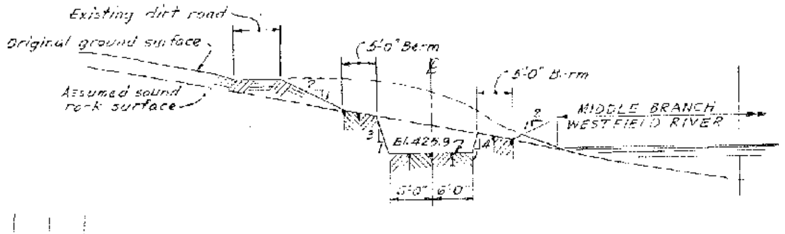
DETAIL A

SCALE ½" = 1'-0"



SECTION B-B

SCALE - 1/4" = 1'-0"

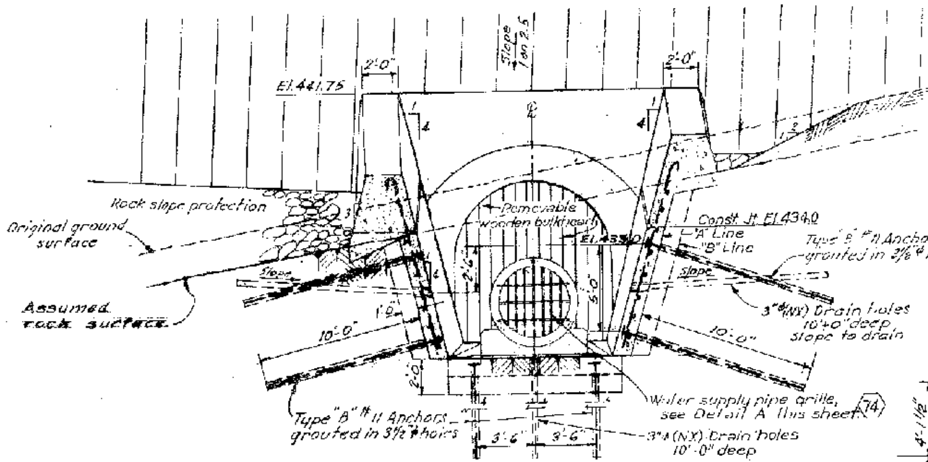


SECTION D-D

SCALE - 1" = 10'

NOTES

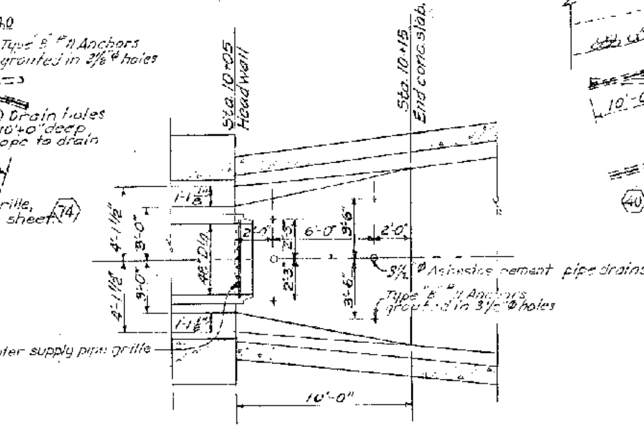
For details of Type "B" Anchors, see Sheet No. 34 & 42
Line "A" indicates minimum thickness of concrete.
Line "B" indicates payment line for rock excavation and concrete.
For Structural joint details see Sheet No. 34
All channel lining to be reinforced with #6 rods sp. 1'-0" c.c. B.W.
Figures in hexagons indicate item numbers under which payment will be made.
All concrete in retaining walls will be paid for under Item No. 55.
All concrete in linings will be paid for under Item No. 56A
All steel reinforcement will be paid for under Item No. 64.



2'-0"
El. 441.75
Slope 1 on 2.5
¢
Rock slope protection
Original ground surface
Assumed rock surface
Removable wooden bulkhead
Const. Jt. El. 434.0
"A" Line
"B" Line
Type "B" #11 Anchors grouted in 3½"⌀ holes
3"⌀ (NX) Drain holes 10'-0" deep slope to drain
10'-0"
Water supply pipe grille, see Detail "A" this sheet (74)
3"⌀ (NX) Drain holes 10'-0" deep
3'-6"
3'-6"
Type "B" #11 Anchors grouted in 3½"⌀ holes

SECTION C-C

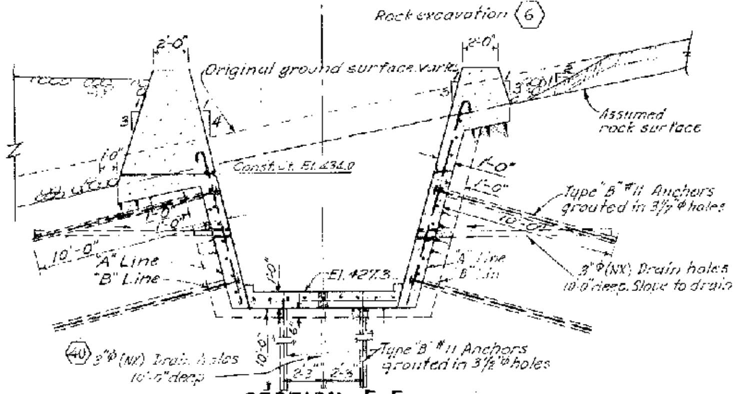
SCALE - 1/4" = 1'-0"



Sta. 10+05 Headwall
Sta. 10+15 End conc. slab.
4'-1½"
4'-1½"
3'-0"
3'-0"
6'-0"
2'-0"
3½"⌀ Asbestos cement pipe drains (40)
Type "B" #11 Anchors grouted in 3½"⌀ holes
Water supply pipe grille
10'-0"

PLAN OF APRON

SCALE: 1/4" = 1'-0"



¢ of Outlet Works
Earth excavation (3)
Rock excavation (6)
2'-0"
Original ground surface varies
Assumed rock surface
Const. Jt. El. 434.0
Type "B" #11 Anchors grouted in 3½"⌀ holes
3"⌀ (NX) Drain holes 10'-0" deep. Slope to drain
10'-0"
"A" Line
"B" Line
El. 427.3
(40) 3"⌀ (NX) Drain holes 10'-0" deep
Type "B" #11 Anchors grouted in 3½"⌀ holes

SECTION E-E

SCALE: 1/4" = 1'-0"

GRAPHIC SCALES

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B.	K.H.W.	P.H.

PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

WATER SUPPLY OUTLET PORTAL

PLAN AND SECTIONS

MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

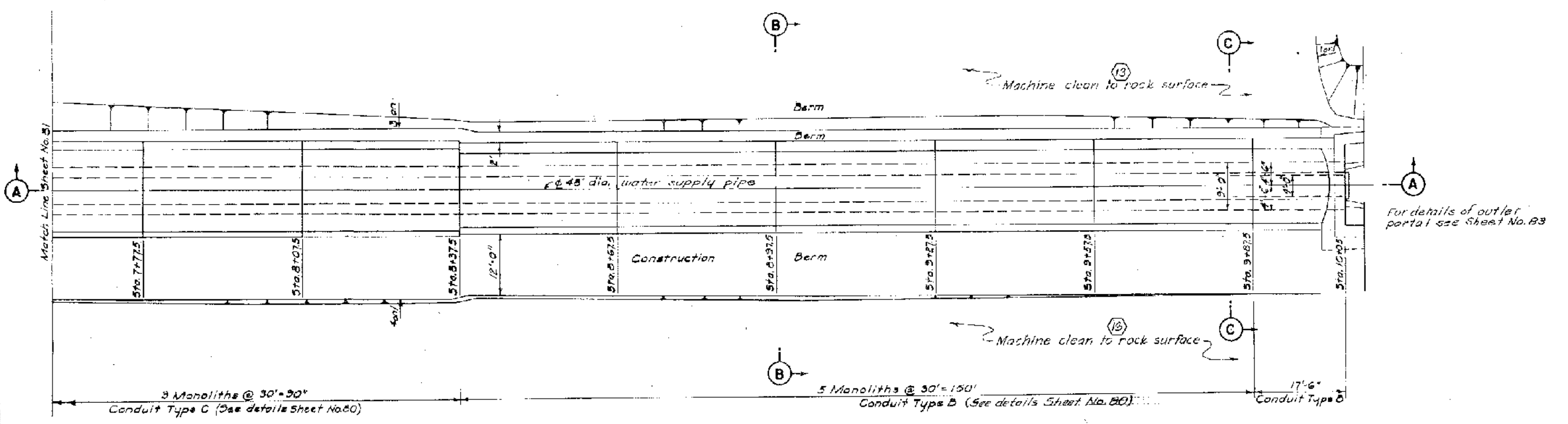
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE - AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

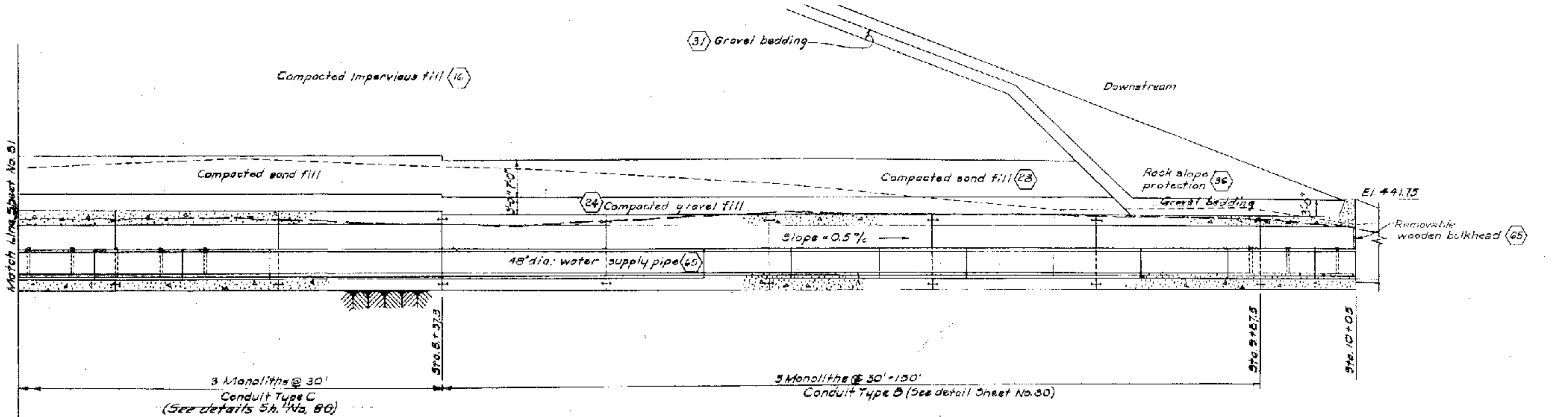
DRAWING NUMBER
CT-1-5789

SHEET 83

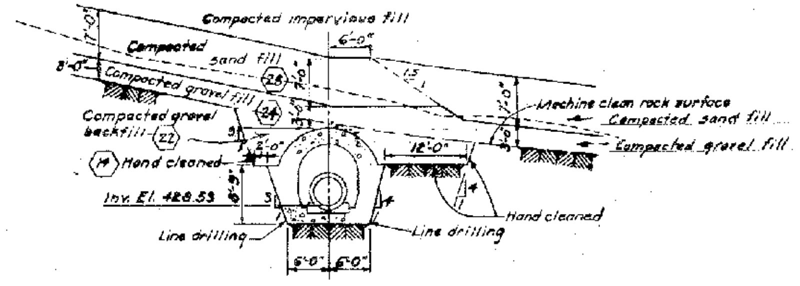
CORPS OF ENGINEERS U.S. ARMY



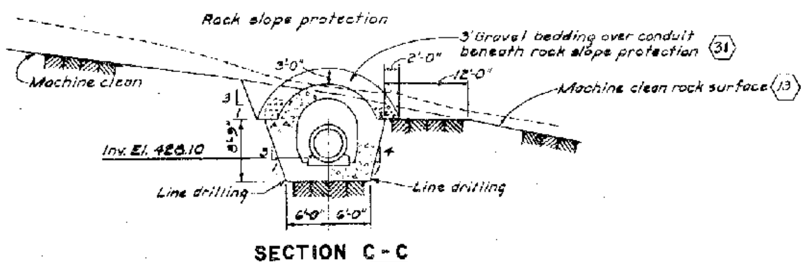
PLAN
SCALE: 1" = 10'



SECTION A-A
SCALE: 1" = 10'



SECTION B-B
STA. 9+00
SCALE: 1" = 10'



SECTION C-C
STA. 9+85
SCALE: 1" = 10'

NOTES -
For General Notes see Sheet No. 80.
Initial layer of gravel fill over conduit shall be 12 inches

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.J.B. | DR. BY D. McD. | CK. BY P.K.

PROJECT ENGINEER

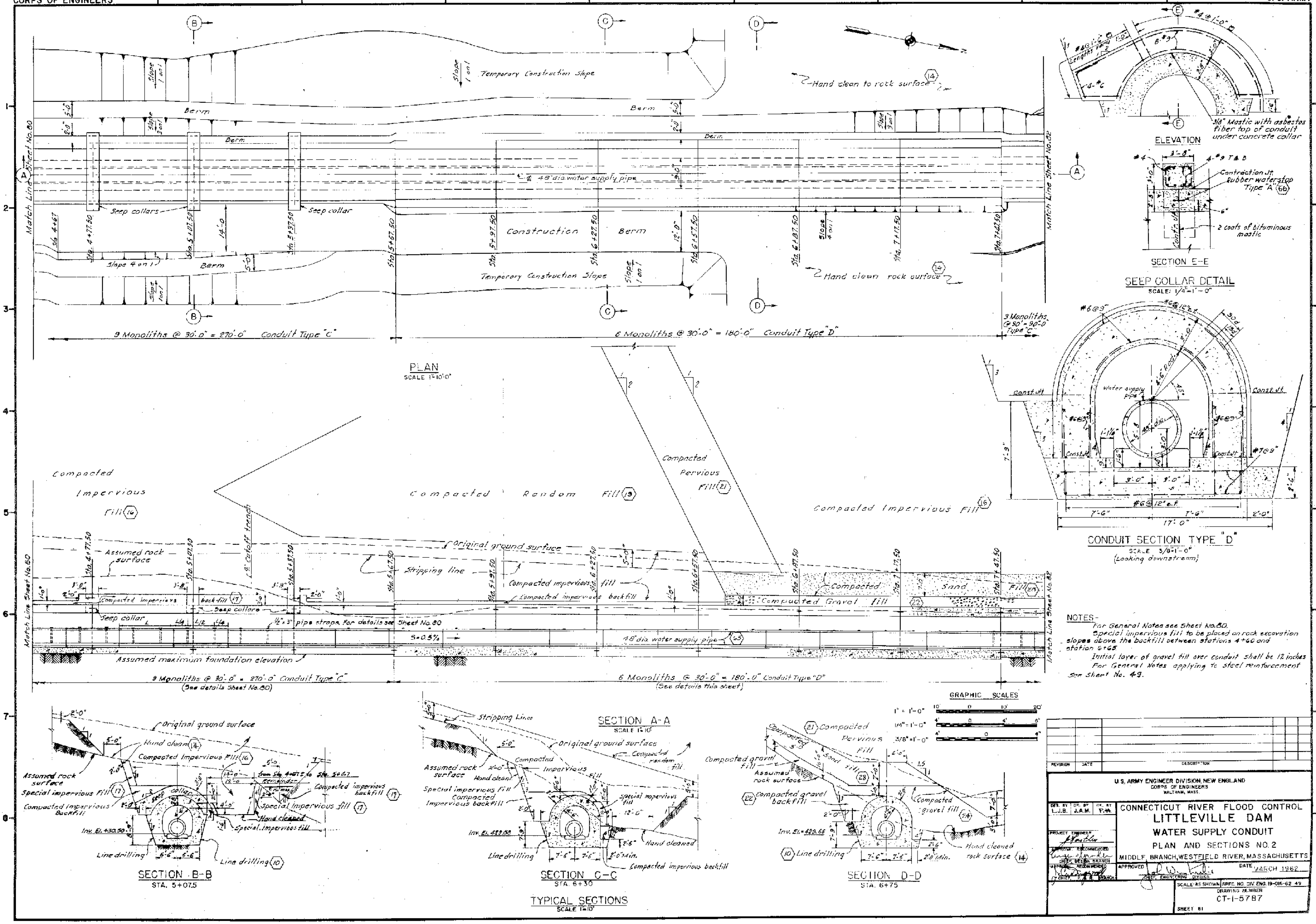
APPROVAL RECOMMENDED
CHIEF, STR. DESIGN BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY CONDUIT
PLAN AND SECTIONS NO. 3
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE: 1" = 10'
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5788
SHEET 82



NOTES-

For General Notes see Sheet No. 80.

Special impervious fill to be placed on rock excavation slopes above the backfill between stations 4+60 and station 6+65.

Initial layer of gravel fill over conduit shall be 12 inches

For General Notes applying to steel reinforcement see Sheet No. 49.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

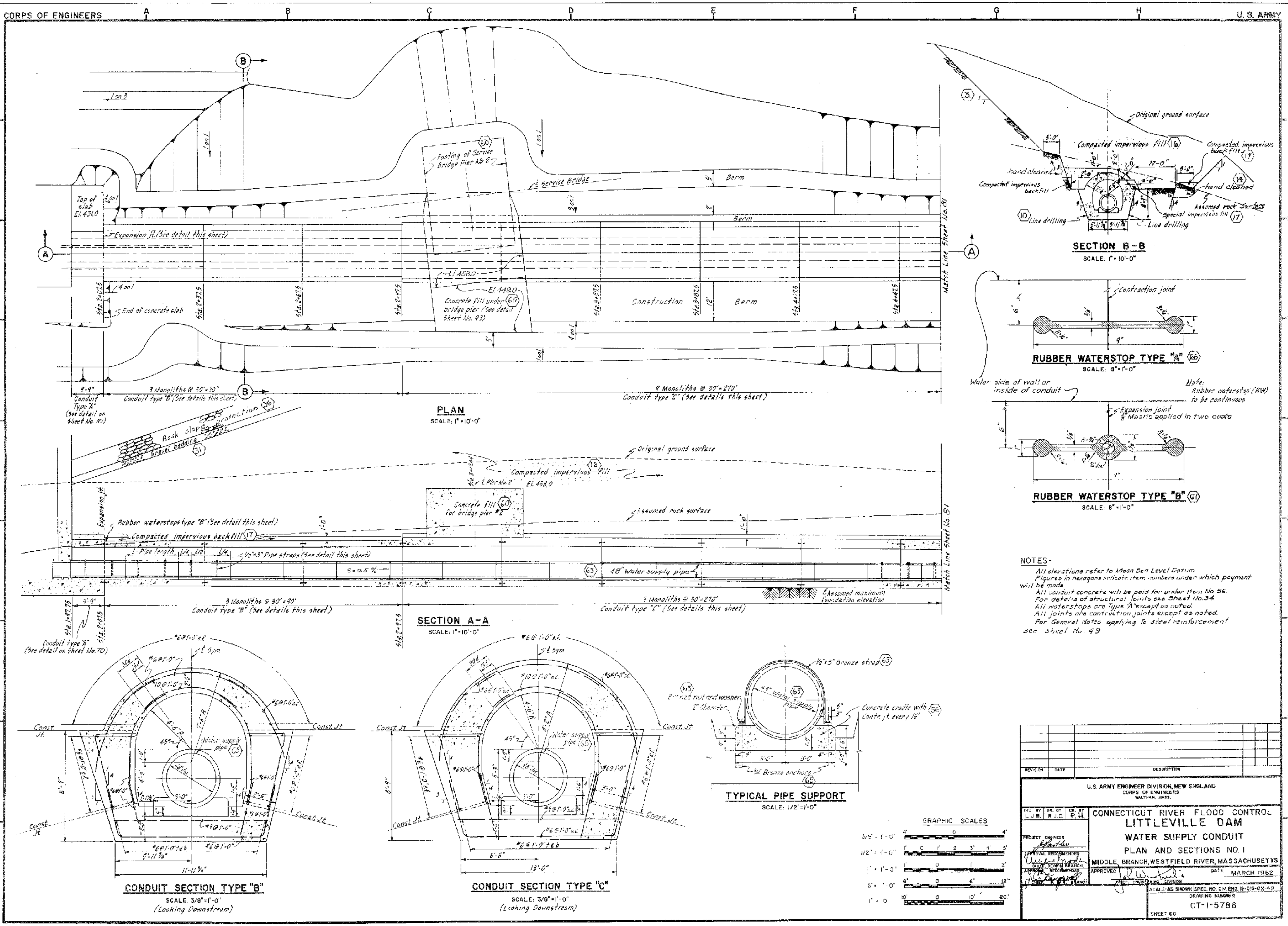
DES. BY	DR. BY	CK. BY
L.J.B.	J.A.M.	P.H.

PROJECT ENGINEER J. Westley
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY CONDUIT
PLAN AND SECTIONS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5787
SHEET 81



NOTES-

All elevations refer to Mean Sea Level Datum.

Figures in hexagons indicate item numbers under which payment will be made

All conduit concrete will be paid for under item No. 56.

For details of structural joints see Sheet No. 34.

All waterstops are Type "A" except as noted.

All joints are contraction joints except as noted.

For General Notes applying to steel reinforcement see Sheet No. 49

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B.	R.J.C.	P.H.

PROJECT ENGINEER

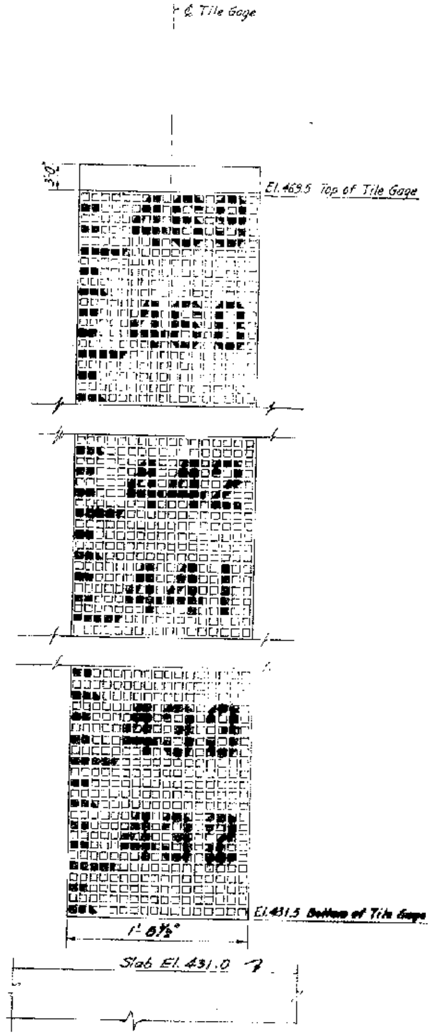
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, E. B. BRANCH

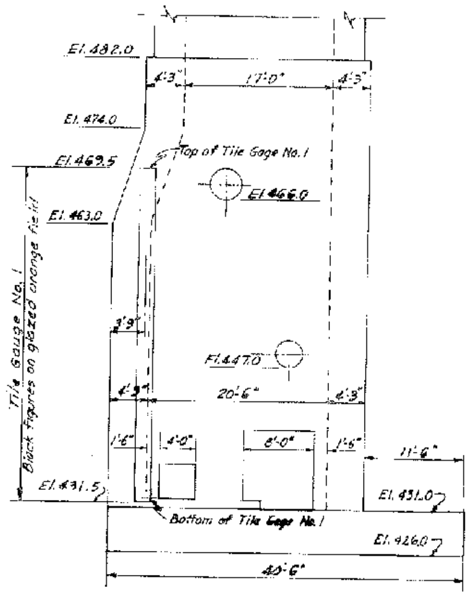
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY CONDUIT
PLAN AND SECTIONS NO. 1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

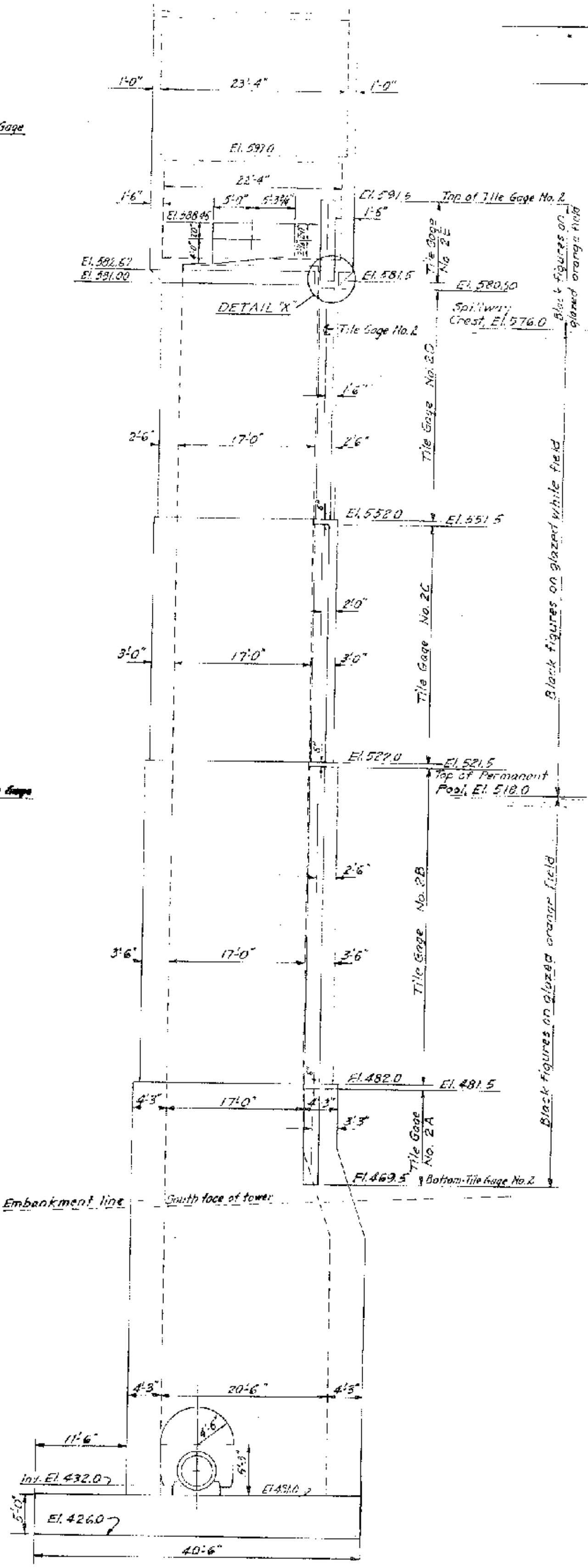
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-43
DRAWING NUMBER
CT-1-5786
SHEET 60



TILE GAGE NO. 1
SCALE: 1-1/2" = 1'-0"

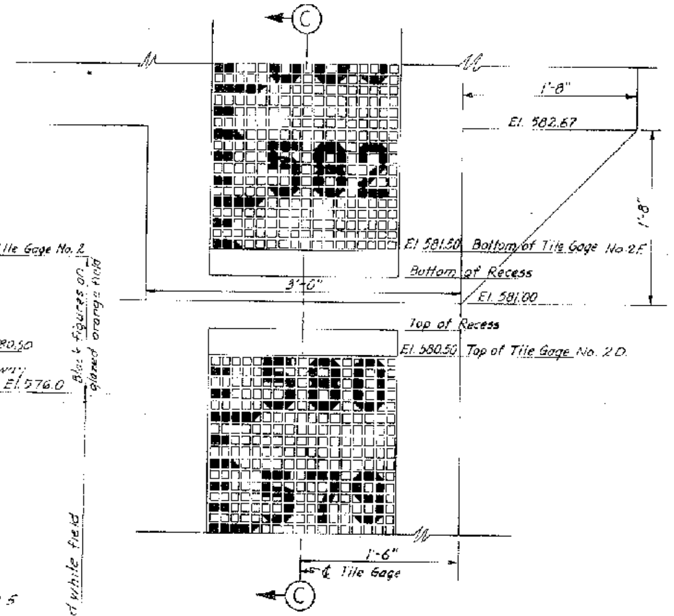




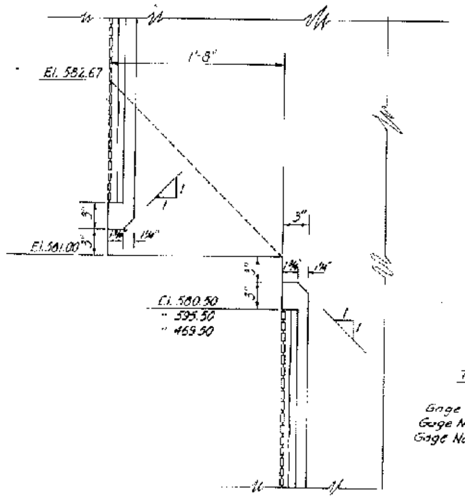
WATER SUPPLY INTAKE TOWER

ELEVATION NORTH SIDE
SCALE: 1/8" = 1'-0"

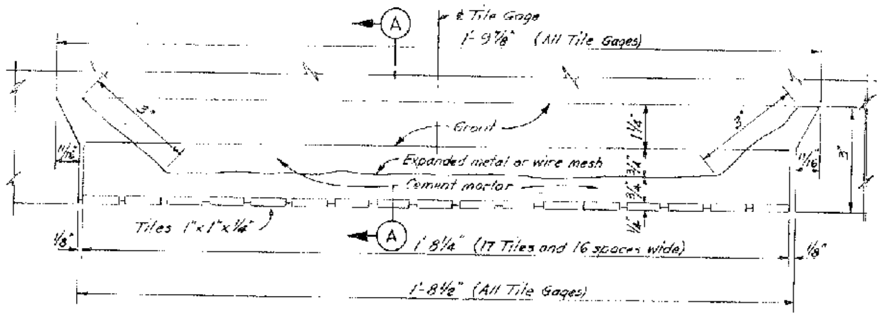
ELEVATION-SOUTH SIDE
SCALE: 1/8" = 1'-0"



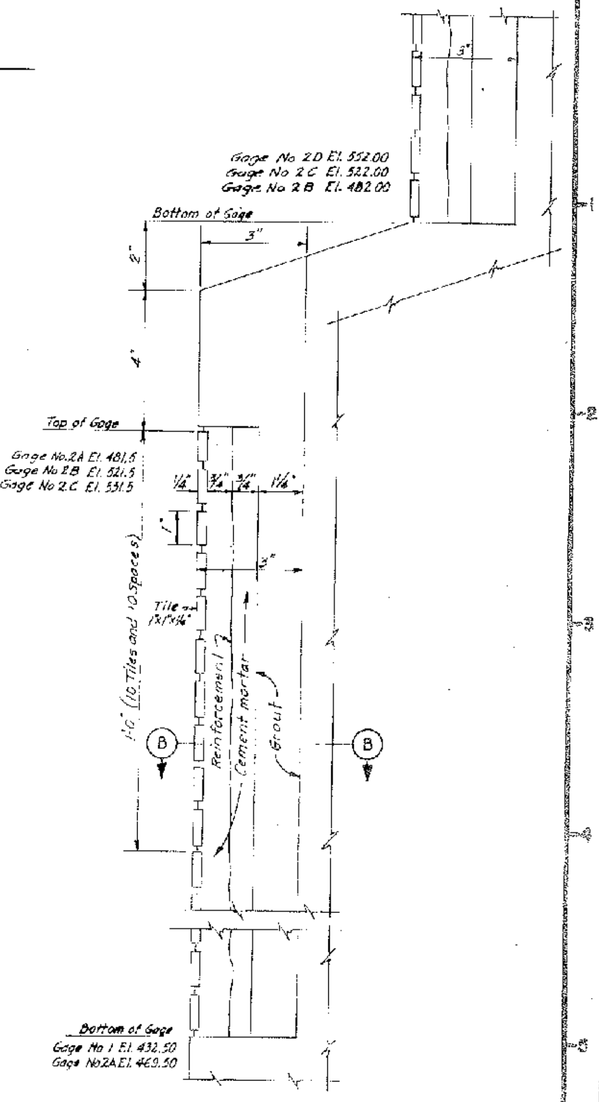
DETAIL "X"
SCALE: 1-1/2" = 1'-0"



SECTION C-C
SCALE: 1-1/2" = 1'-0"

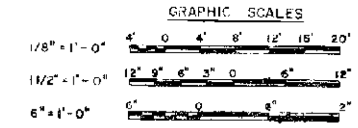


SECTION B-B
SCALE: 6" = 1'-0



SECTION A-A
SCALE: 6" = 1'-0"

NOTES:
Elevations refer to Mean Sea Level Datum.
Tile gages will be paid for under Item No. 72.



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

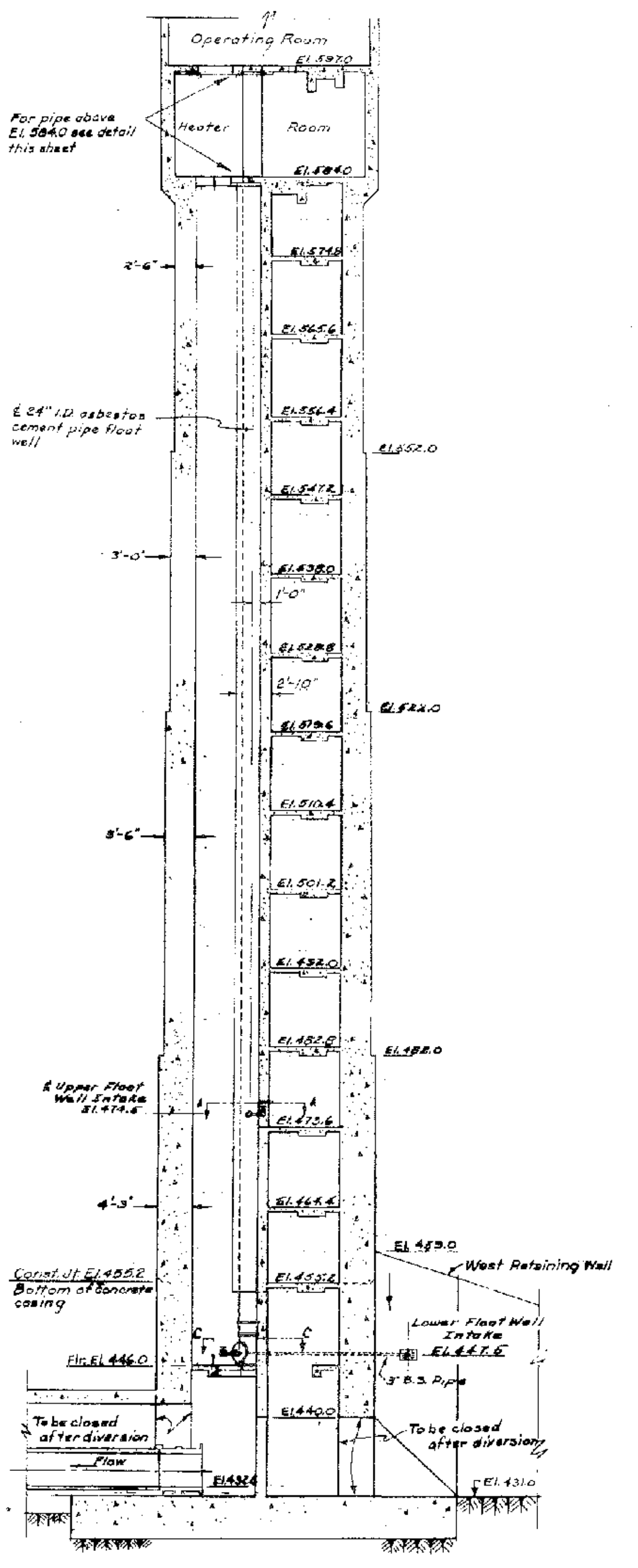
DES. BY L.J.B. DR. BY C.T.M. CK. BY P.H.

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
TILE GAGES
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

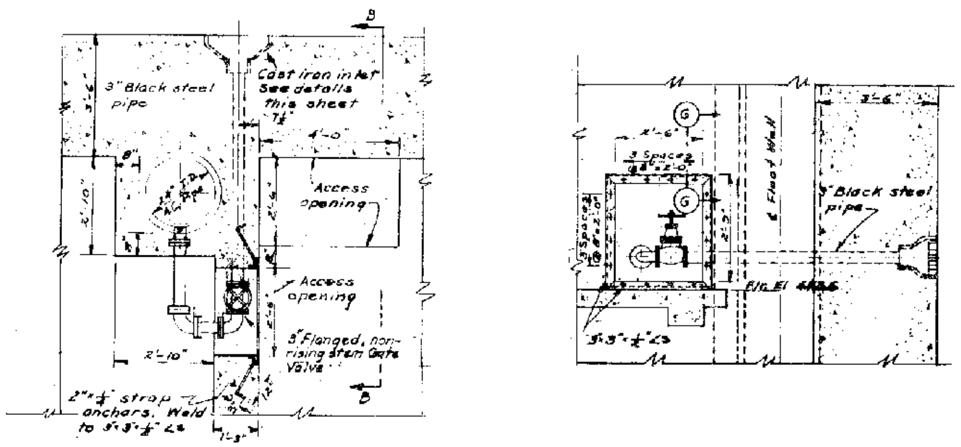
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, P. & R. BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962
SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-I-5785
SHEET 79

CORPS OF ENGINEERS

U. S. ARMY



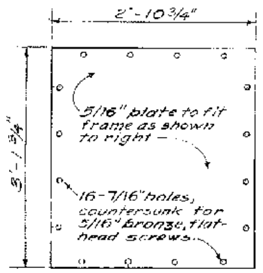
SECTION ON ℄ WATER SUPPLY CONDUIT
SCALE: 1/8"=1'-0"



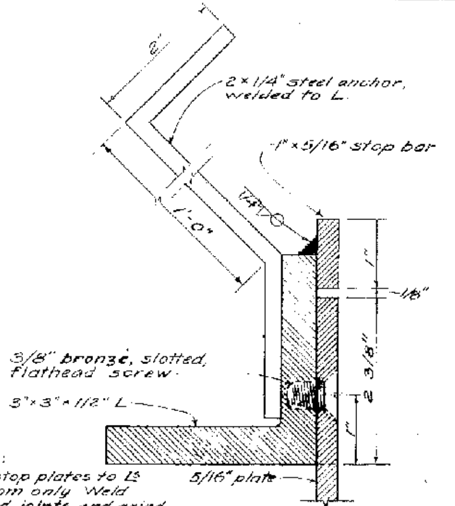
SECTION A-A

SECTION B-B

UPPER FLOAT WELL INTAKE
SCALE: 1/2"=1'-0"

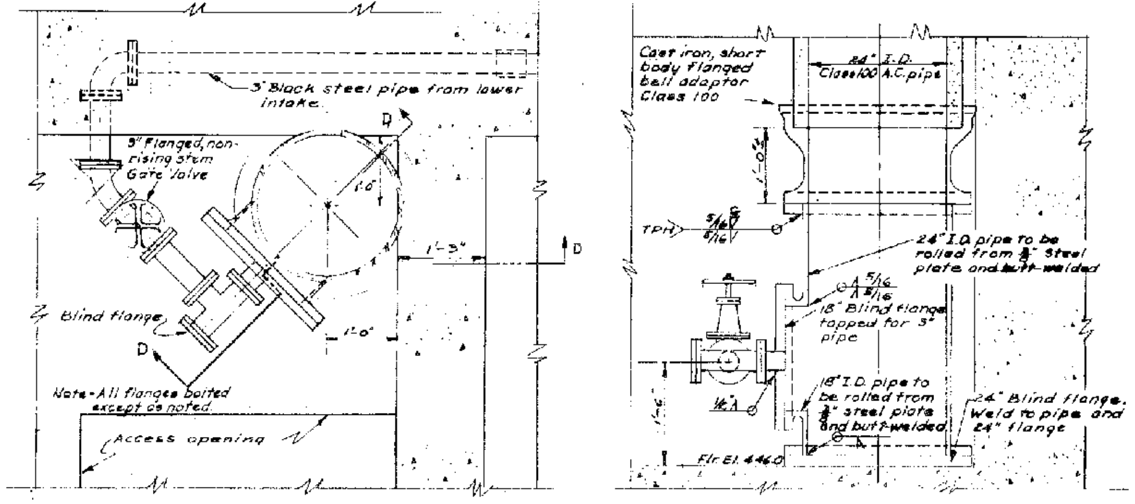

2'-10 3/4"
3'-1 3/4"
5/16" plate to fit frame as shown to right –
16-7/16" holes, countersunk for 5/16" bronze, flat-head screws.

COVER
UPPER INTAKE ACCESS OPENING
SCALE: 1"=1'-0"


2"
2×1/4" steel anchor, welded to L.
1"×5/16" stop bar
1'-0"
1/4"
1"
1/8"
2 3/8"
1"
3/8" bronze, slotted, flathead screw.
3"×3"×1/2" L
5/16" plate

NOTES:
Weld stop plates to Ls at bottom only. Weld mitered joints and grind top surfaces smooth for frame.

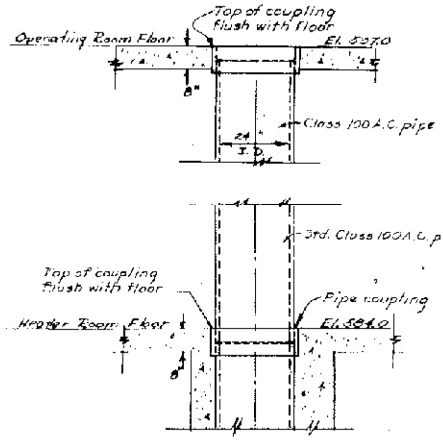
SECTION G-G
FULL SCALE


3" Black steel pipe from lower intake.
3" Flanged, non-rising stem Gate Valve
D
1'-6"
1'-3"
1'-0"
Blind flange
Note - All flanges bolted except as noted.
Access opening
Cast iron, short body flanged bell adaptor Class 100
24" I.D. Class 100 A.C. pipe
1'-0 3/4"
TPH
5/16
24" I.D. pipe to be rolled from 3/8" steel plate and butt-welded
18" Blind flange tapped for 3" pipe
18" I.D. pipe to be rolled from 3/8" steel plate and butt-welded
24" Blind flange. Weld to pipe and 24" flange
Flr. El. 446.0
1'-6"

SECTION C-C

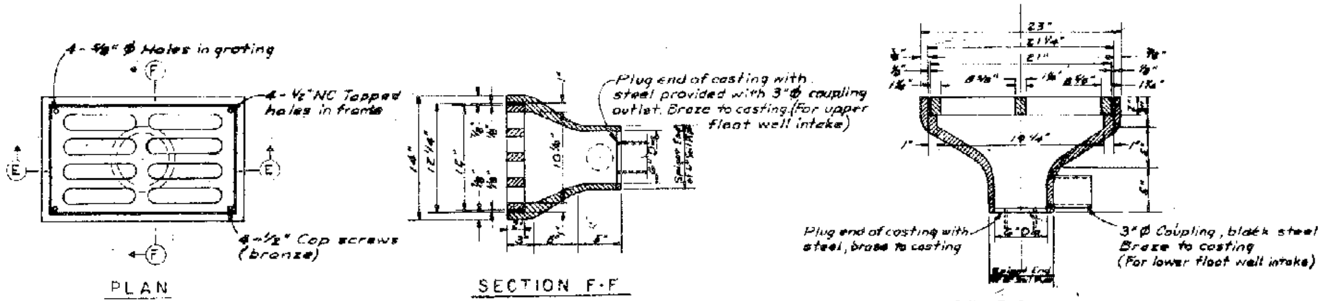
SECTION D-D

ACCESS CHAMBER DETAILS
SCALE: 1"=1'-0"



FLOAT WELL DETAIL
DETWEEN EL. 584.0 & EL. 597.0
SCALE: 1/2"=1'-0"

NOTES-
All elevations refer to Mean Sea level Datum.
Float Well and accessories will be paid for under Item No. 70.
For location and details of float well cabinet see Sheet No. 63.


4-5/8" ⌀ Holes in grating
4-1/2" NC Tapped holes in frame
4-1/2" Cap screws (bronze)
F
E
14"
12 1/4"
10 3/4"
3"
Plug end of casting with steel provided with 3" ⌀ coupling outlet. Braze to casting. (For upper float well intake)
23"
21 1/4"
21"
19 1/4"
1"
Plug end of casting with steel, braze to casting
3" ⌀ Coupling, black steel Braze to casting (For lower float well intake)

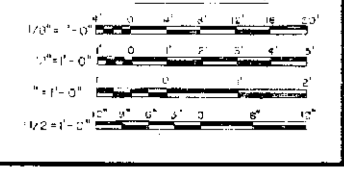
PLAN

SECTION F-F

SECTION E-E

FLOAT WELL INTAKE DETAILS
SCALE: 1 1/2"=1'-0"

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.L.B. | DR. BY K.R.W. | CK. BY P.H.

PROJECT ENGINEER

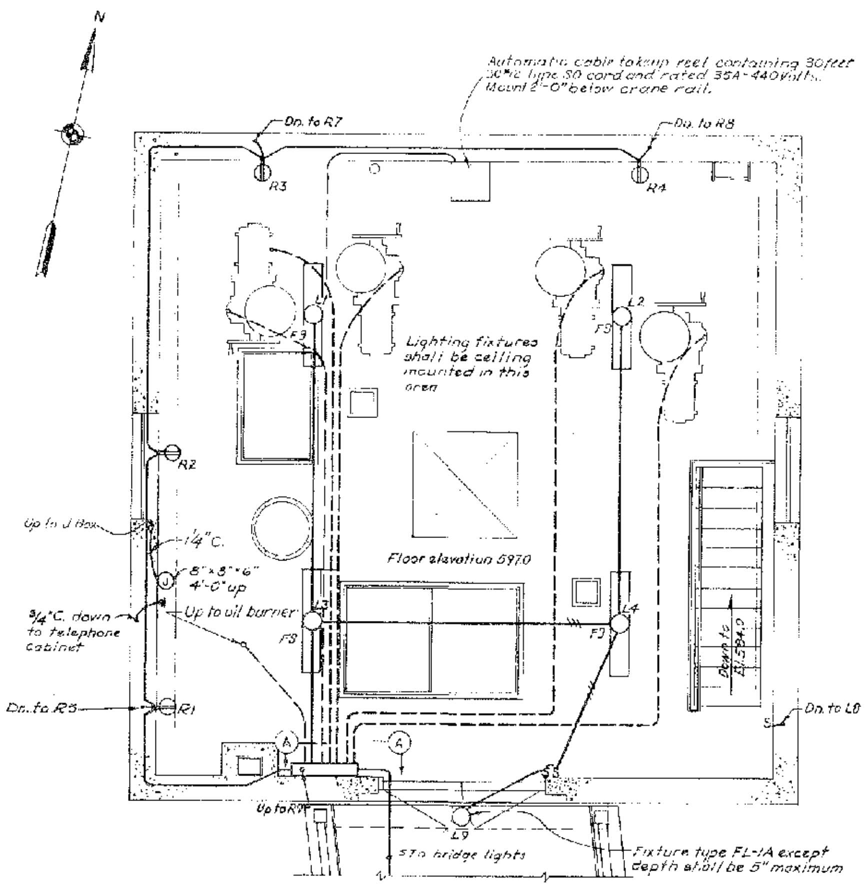
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
FLOAT WELL AND ACCESSORIES
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

APPROVED
CHIEF, ENGINEERING DIVISION

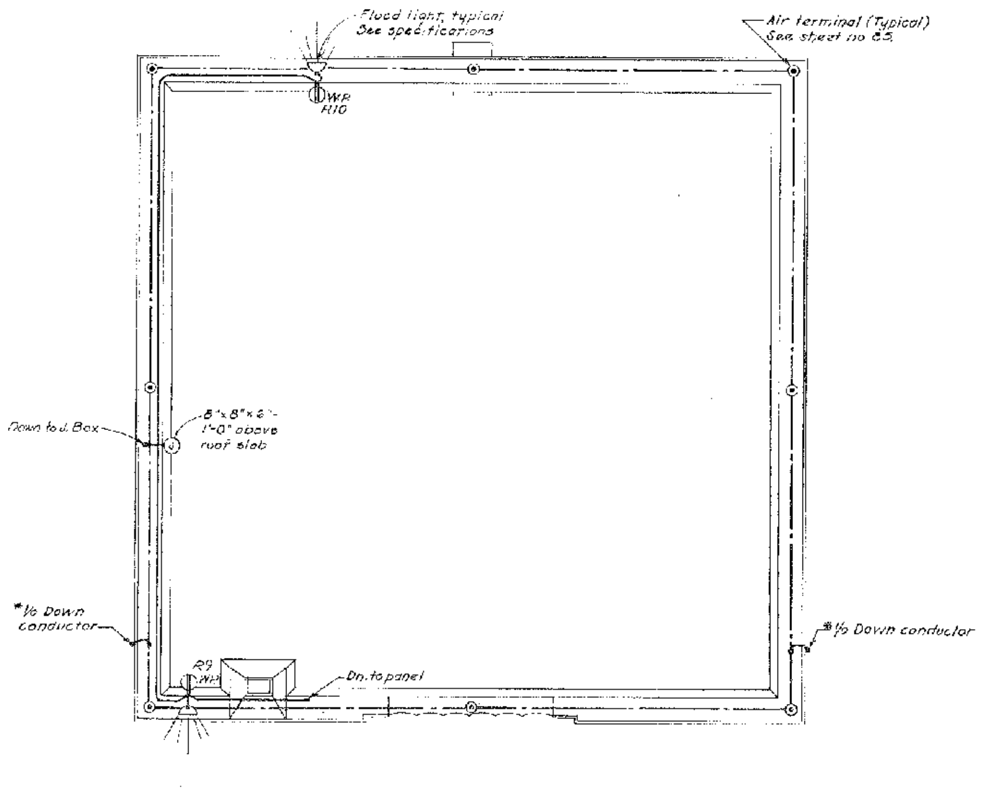
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5784
SHEET 78


N
Automatic cable takeup reel containing 30 feet 30#12 type SO cord and rated 35A-440 Volts. Mount 2'-0" below crane rail.
Dn. to R7
Dn. to R8
R3
R4
R2
R1
L1
L2
L3
L4
L9
F3
Lighting fixtures shall be ceiling mounted in this area
Floor elevation 597.0
Up to J Box
1¼"C.
8"×8"×6" 4'-0" up
3/4"C. down to telephone cabinet
Up to oil burner
Dn. to R5
Down to El. 584.0
Dn. to L8
Up to R1
ST to bridge lights
Fixture type FL-1A except depth shall be 5" maximum
A

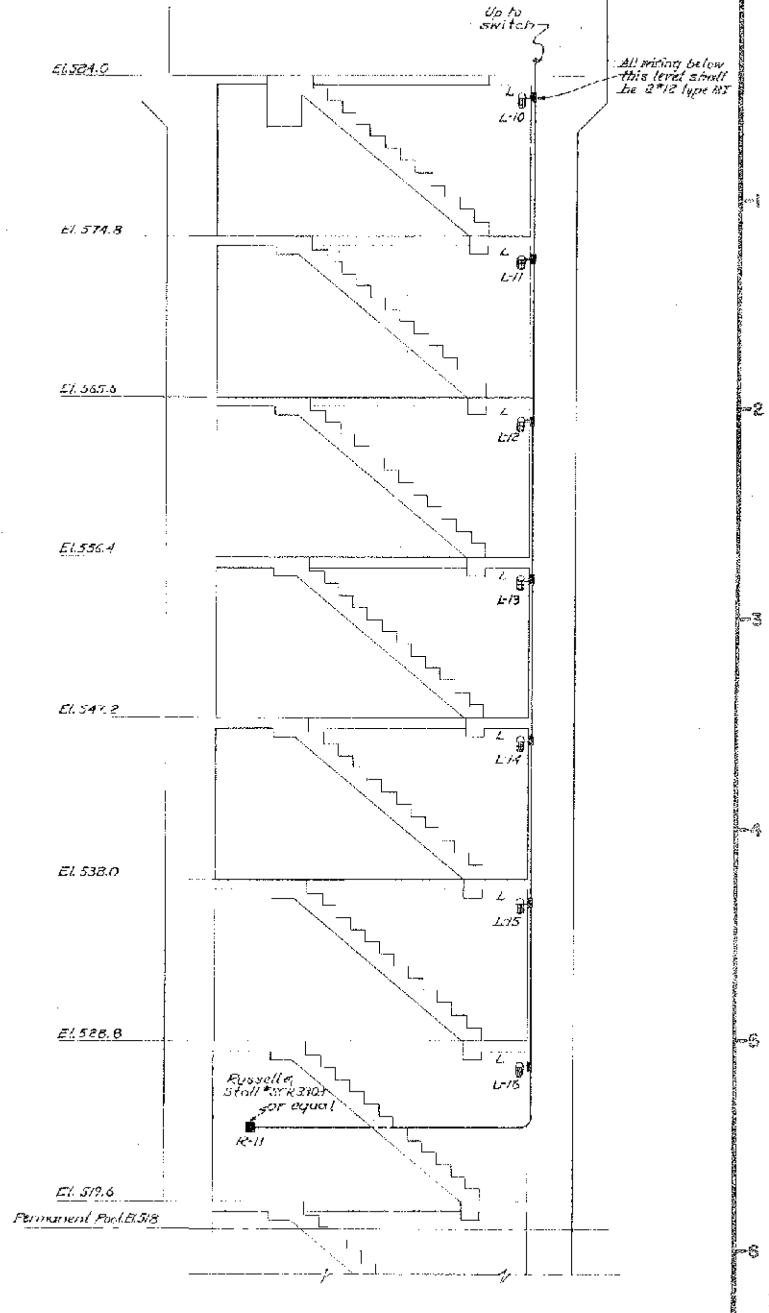
OPERATING FLOOR PLAN

SCALE 3/8" = 1'-0"


Flood light, typical See specifications
Air terminal (Typical) See sheet no 65.
WP R10
Down to J. Box
8"×8"×6" - 1'-0" above roof slab
*1/0 Down conductor
R9 WP
Dn. to panel
*1/0 Down conductor

ROOF PLAN

SCALE 3/8" = 1'-0"

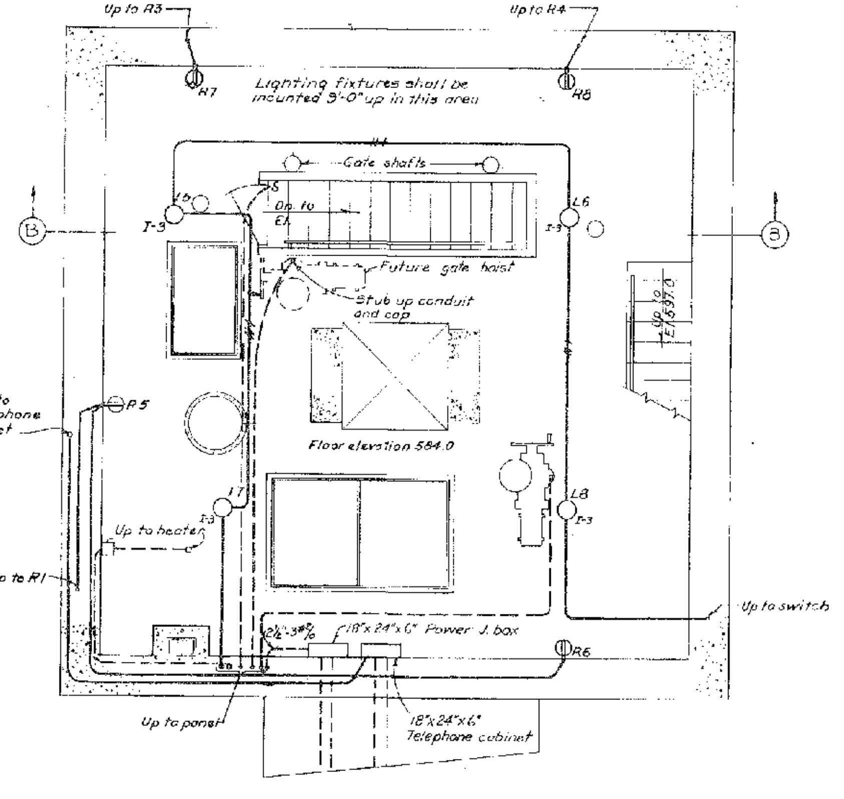


SECTION B-B

SCALE 1/4" = 1'-0"

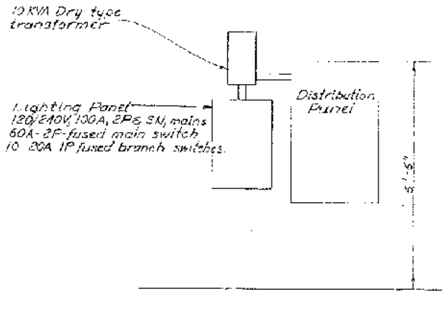
NOTE

Electrical work in the water supply intake tower will be paid for under Item 86.



HEATER FLOOR PLAN

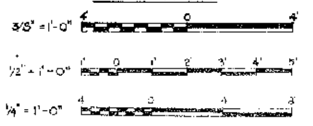
SCALE 3/8" = 1'-0"


10 KVA Dry type transformer
Lighting Panel 120/240V, 100A, 2P & SN, mains 60A-2P-fused main switch 10 20A 1P fused branch switches.
Distribution Panel
5'-5"

ELEVATION A - A

SCALE 1/2" = 1'-0"

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

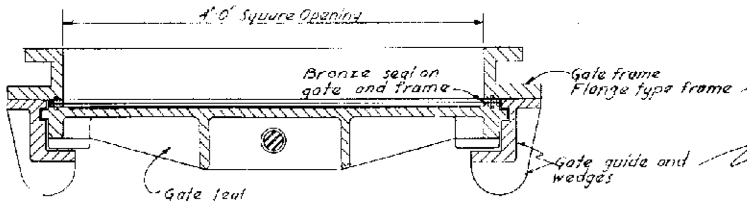
DES. BY J.A.D.
DR. BY J.G.M. & T.N.
CK. BY
SUBMITTED
CHIEF, ELECT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, E. & F. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
ELECTRICAL
PLANS AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

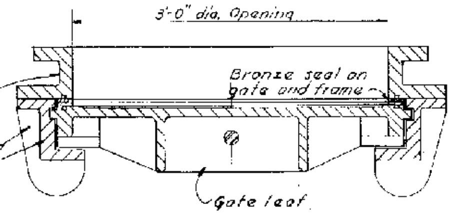
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5783
SHEET 77

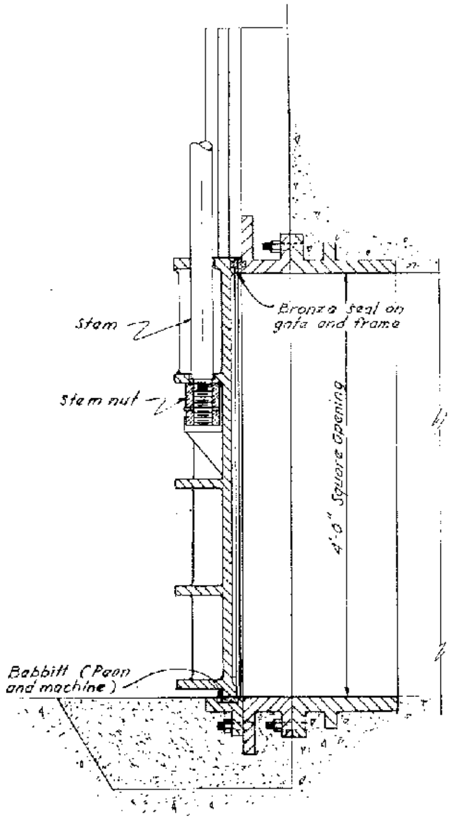
CORPS OF ENGINEERS U.S. ARMY



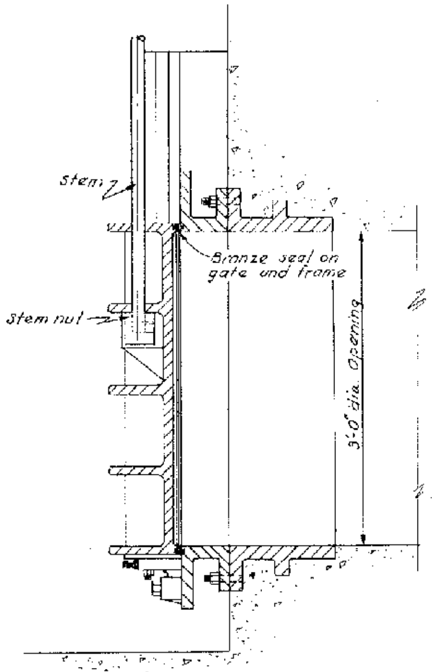
PLAN – 48" GATE



PLAN – 36" GATE



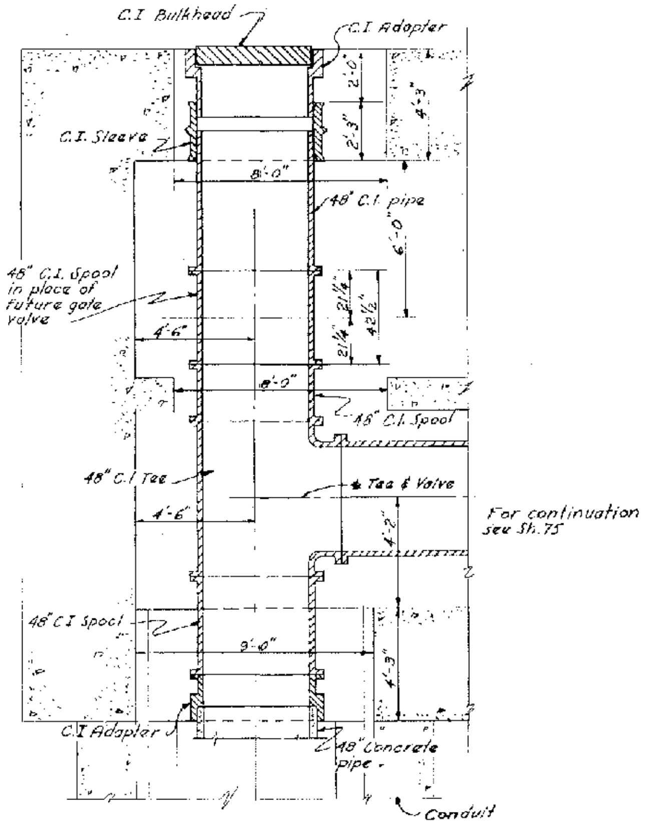
SECTION THRU 48" GATE
(12" Gate similar except for dimensions and circular opening)



SECTION THRU 36" GATE

GATE ASSEMBLY DETAILS

SCALE 1½" = 1'-0"



PLAN

DETAIL – 48" C.I. PIPE AT EL. 431.0

SCALE 3/8" 1'-0"

NOTES

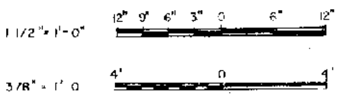
All work, materials and equipment in connection with the heating system, as specified, will be paid for under Item No. 83.

All work, materials and equipment in connection with the gates, valves and accessories, as specified, will be paid for under Item No. 84.

All work, materials and equipment in connection with the traveling crane, as specified, will be paid for under Item No. 85

All work, materials and equipment in connection with the 48" water supply piping as specified, will be paid for under Item No. 65.

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

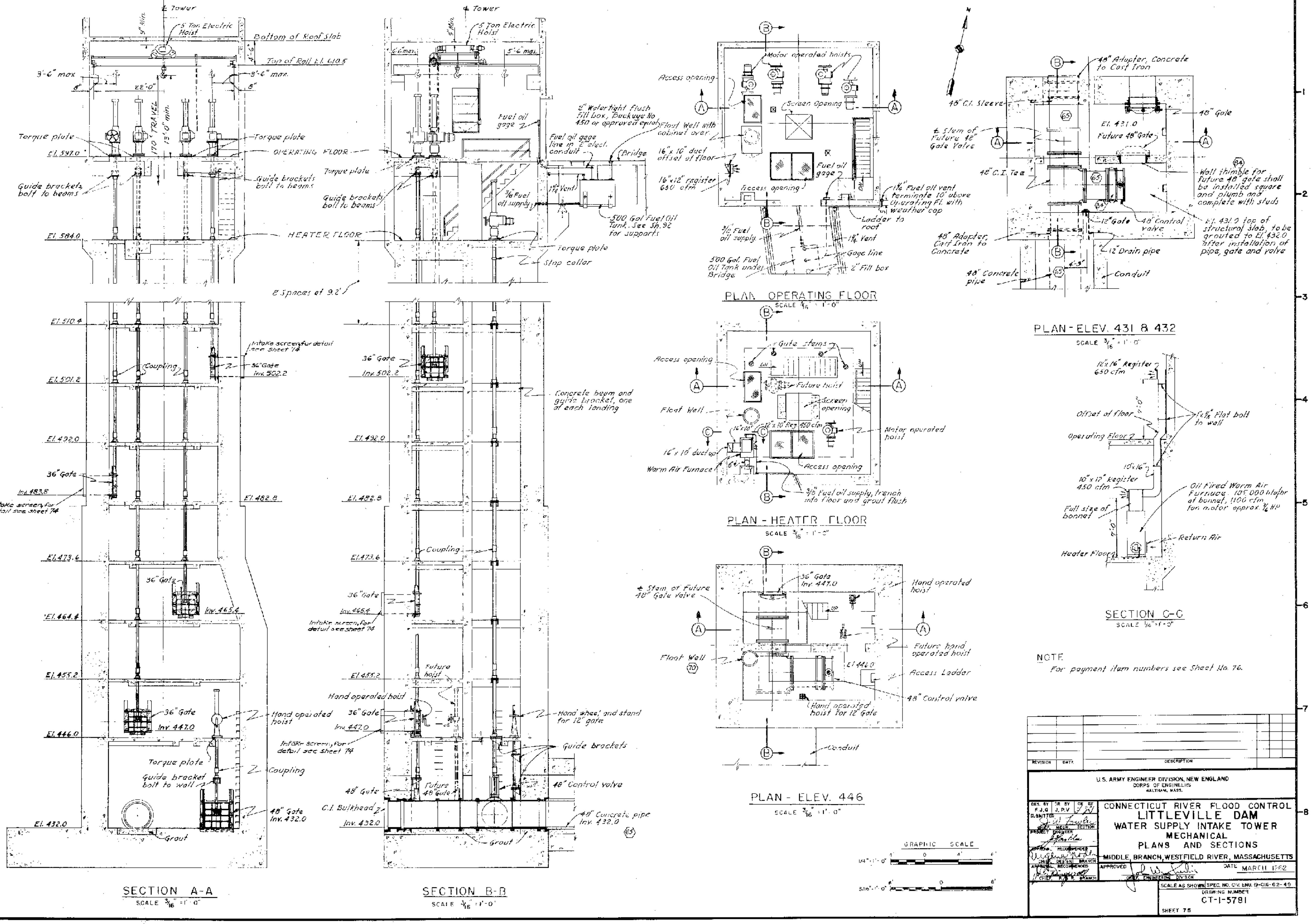
DES. BY F.J.S.	DR. BY J.P.V.	CK. BY

SUBMITTED J. W. Fowler
CHIEF, MECH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, E. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
MECHANICAL
GATE ASSEMBLIES & MISCELLANEOUS DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5782
SHEET 74



NOTE
For payment item numbers see Sheet No. 76.

REVISION	DATE	DESCRIPTION

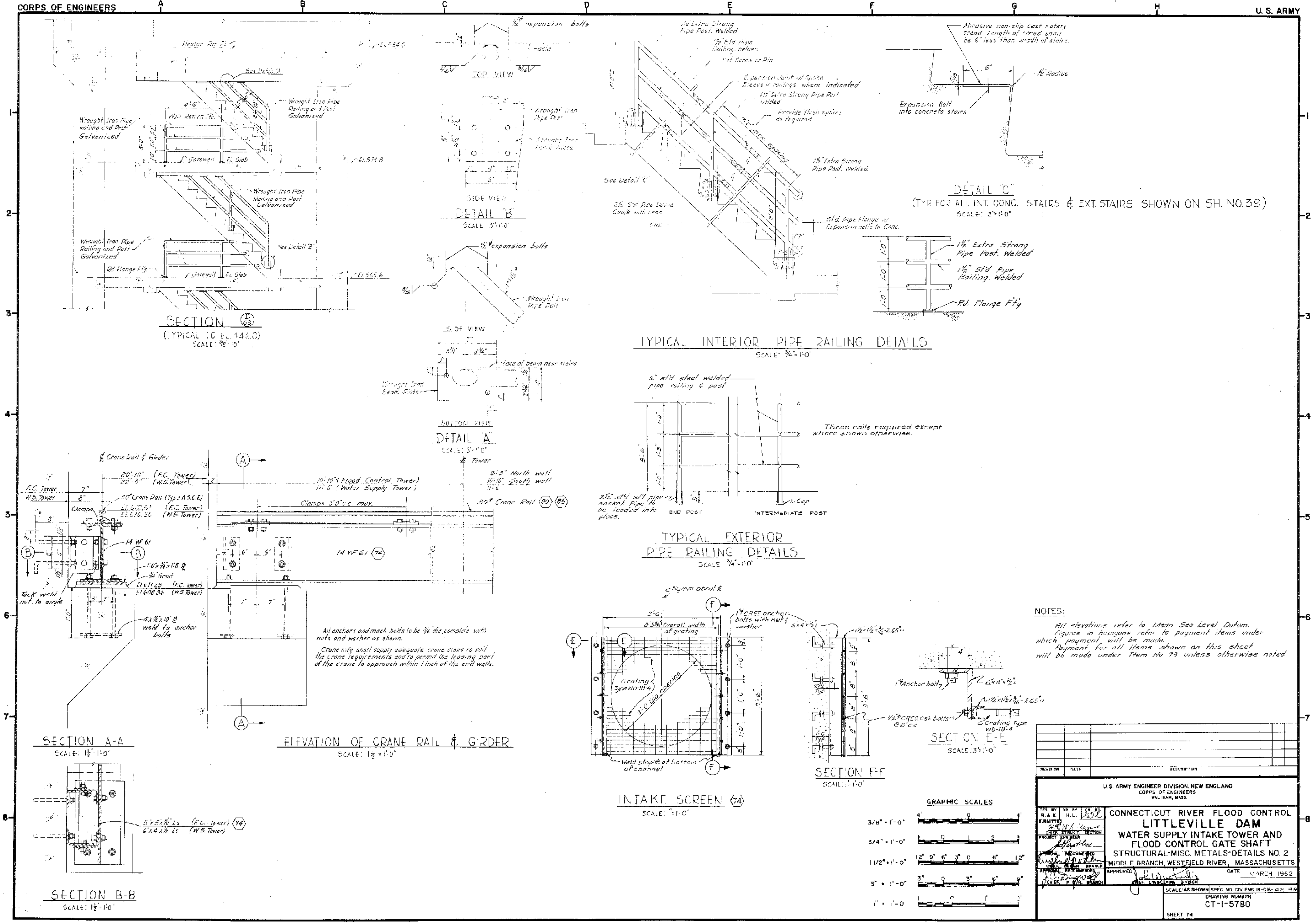
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY F.J.Q. DR. BY J.P.V. CK. BY
SUBMITTED
CHIEF, MECH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
MECHANICAL
PLANS AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5781
SHEET 75



All anchors and mach. bolts to be 3/4" dia. complete with nuts and washer as shown.

Crane mfg. shall supply adequate crane stops to suit the crane requirements and to permit the leading part of the crane to approach within 1 inch of the end walls.

Three rails required except where shown otherwise.

NOTES:

All elevations refer to Mean Sea Level Datum.

Figures in hexagons refer to payment items under which payment will be made.

Payment for all items shown on this sheet will be made under Item No 73 unless otherwise noted.

REVISION	DATE	DESCRIPTION

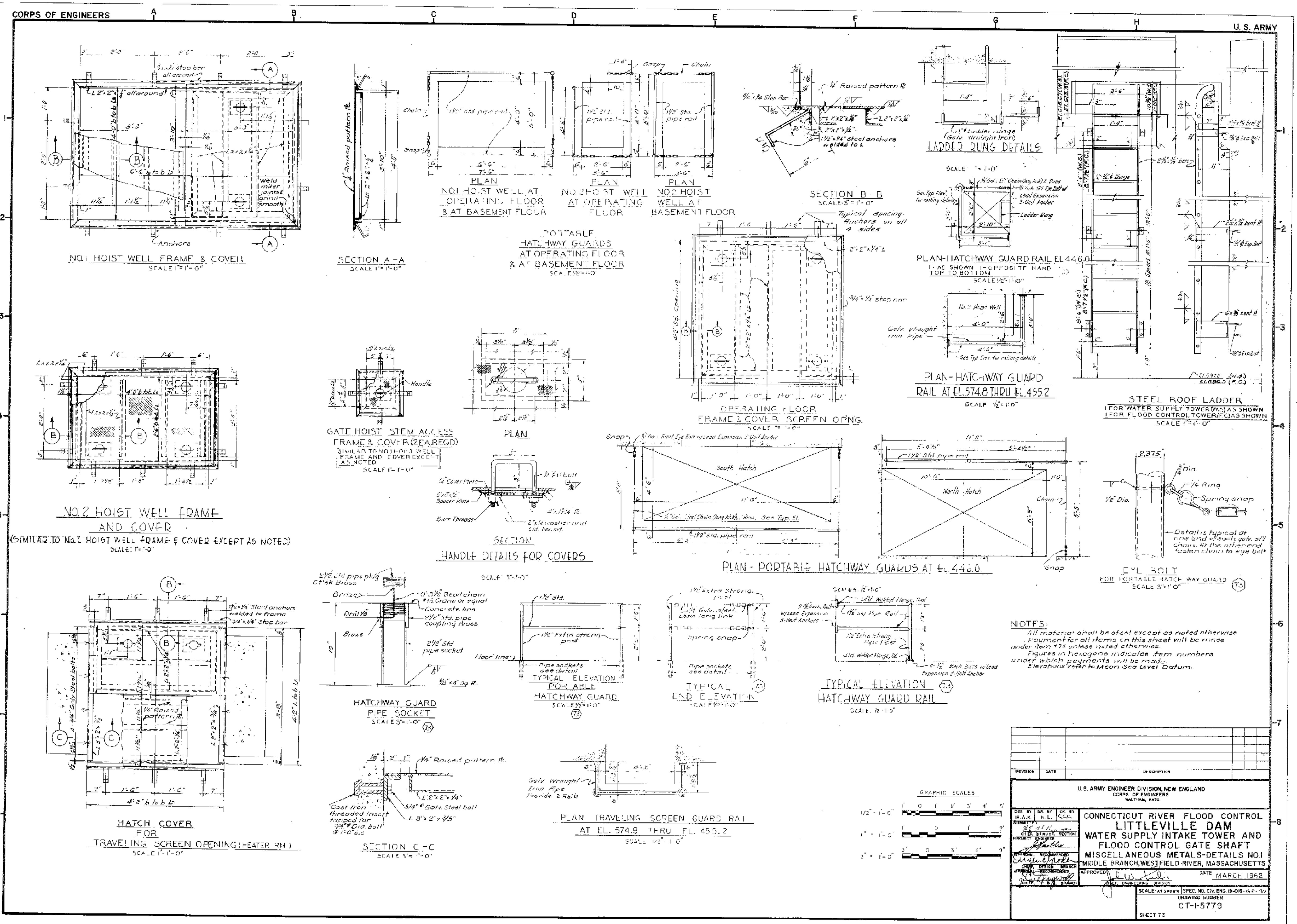
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R.A.K.
DR. BY H.L.
CH. BY
SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER AND
FLOOD CONTROL GATE SHAFT
STRUCTURAL-MISC. METALS-DETAILS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1952

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-52-49
DRAWING NUMBER
CT-1-5780
SHEET 74


CORPS OF ENGINEERS
U.S. ARMY
NO.1 HOIST WELL FRAME & COVER
SCALE 1"=1'-0"
SECTION A-A
SCALE 1"=1'-0"
PLAN
NO.1 HOIST WELL AT OPERATING FLOOR & AT BASEMENT FLOOR
PLAN
NO.2 HOIST WELL AT OPERATING FLOOR
PLAN
NO.2 HOIST WELL AT BASEMENT FLOOR
PORTABLE HATCHWAY GUARDS AT OPERATING FLOOR & AT BASEMENT FLOOR
SCALE 1/2"=1'-0"
SECTION B-B
SCALE 3"=1'-0"
LADDER RUNG DETAILS
SCALE 1"=1'-0"
PLAN-HATCHWAY GUARD RAIL EL.446.0
1-AS SHOWN 1-OPPOSITE HAND TOP TO BOTTOM
SCALE 1/2"=1'-0"
PLAN-HATCHWAY GUARD RAIL AT EL.574.8 THRU EL.455.2
SCALE 1/2"=1'-0"
STEEL ROOF LADDER
1 FOR WATER SUPPLY TOWER (W.S.) AS SHOWN
1 FOR FLOOD CONTROL TOWER (F.C.) AS SHOWN
SCALE 1"=1'-0"
NO.2 HOIST WELL FRAME AND COVER
(SIMILAR TO No.1 HOIST WELL FRAME & COVER EXCEPT AS NOTED)
SCALE: 1"=1'-0"
GATE HOIST STEM ACCESS FRAME & COVER (2 EA. REQ'D)
SIMILAR TO NO.1 HOIST WELL FRAME AND COVER EXCEPT AS NOTED
SCALE 1"=1'-0"
PLAN
SECTION
HANDLE DETAILS FOR COVERS
SCALE 3"=1'-0"
OPERATING FLOOR FRAME & COVER SCREEN OP'NG.
SCALE 1"=1'-0"
PLAN - PORTABLE HATCHWAY GUARDS AT EL.446.0
South Hatch
North Hatch
EYE BOLT FOR PORTABLE HATCH WAY GUARD
SCALE 3"=1'-0"
73
HATCH COVER FOR TRAVELING SCREEN OPENING (HEATER RM.)
SCALE 1"=1'-0"
HATCHWAY GUARD PIPE SOCKET
SCALE 3"=1'-0"
73
TYPICAL ELEVATION PORTABLE HATCHWAY GUARD
SCALE 1/2"=1'-0"
73
TYPICAL END ELEVATION
SCALE 1/2"=1'-0"
73
TYPICAL ELEVATION HATCHWAY GUARD RAIL
SCALE 1/2"=1'-0"
73
SECTION C-C
SCALE 3"=1'-0"
PLAN TRAVELING SCREEN GUARD RAIL AT EL. 574.8 THRU EL. 455.2
SCALE 1/2"=1'-0"
GRAPHIC SCALES
1/2"=1'-0"
1"=1'-0"
3"=1'-0"

NOTES:

All material shall be steel except as noted otherwise.

Payment for all items on this sheet will be made under item #74 unless noted otherwise.

Figures in hexagons indicates item numbers under which payments will be made.

Elevations refer to Mean Sea Level Datum.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

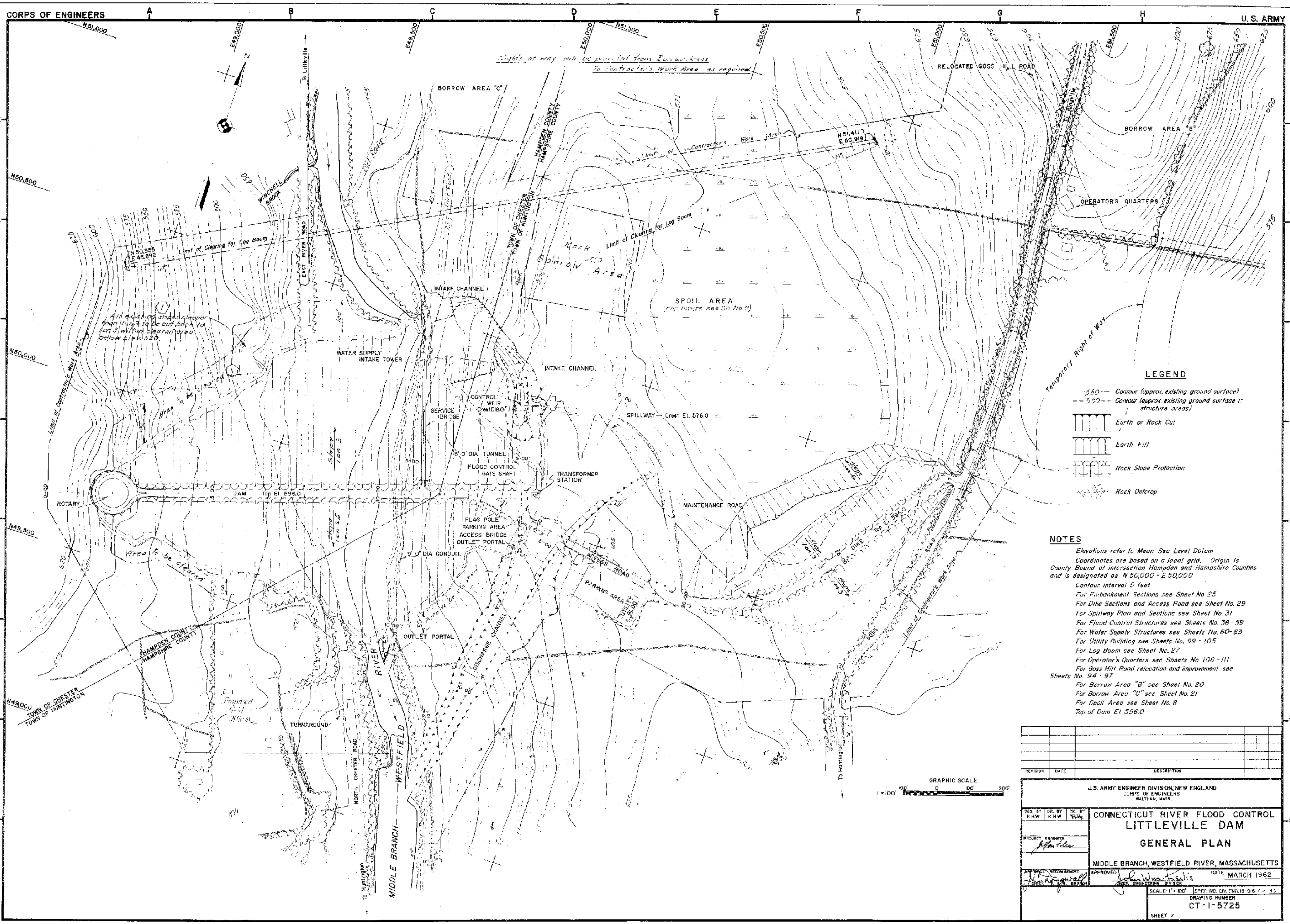
DES. BY	DR. BY	CK. BY
R.A.K.	H.L.	C.C.C.

SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, E & S BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER AND
FLOOD CONTROL GATE SHAFT
MISCELLANEOUS METALS-DETAILS NO.1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5779
SHEET 73



NOTES

Elevations refer to Mean Sea Level Datum

Coordinates are based on a local grid. Origin is County Bound of intersection Hampden and Hampshire Counties and is designated as N 50,000 - E 50,000

Contour interval 5 feet

For Embankment Sections see Sheet No 25

For Dike Sections and Access Road see Sheet No. 29

For Spillway Plan and Sections see Sheet No. 31

For Flood Control Structures see Sheets No. 38 - 59

For Water Supply Structures see Sheets No. 60 - 83

For Utility Building see Sheets No. 99 - 105

For Log Boom see Sheet No. 27

For Operator's Quarters see Sheets No. 106 - 111

For Goss Hill Road relocation and improvement see Sheets No. 94 - 97

For Borrow Area "B" see Sheet No. 20

For Borrow Area "C" see Sheet No. 21

For Spoil Area see Sheet No. 8

Top of Dam El. 596.0

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
K.H.W	K.H.W	R.H.

PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GENERAL PLAN
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVAL RECOMMENDED
CHIEF, ENGR. BRANCH

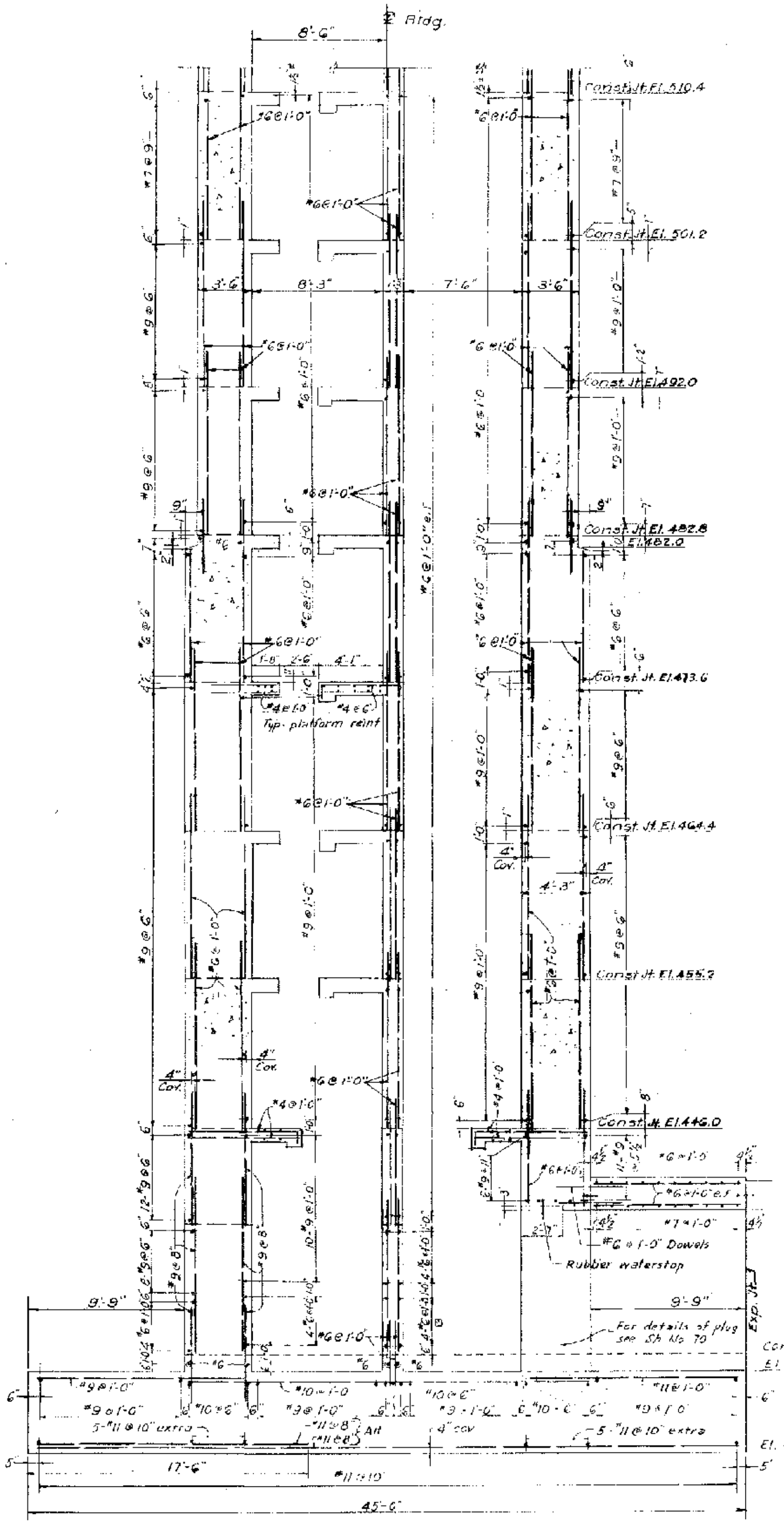
APPROVED John Wm. Leslie
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

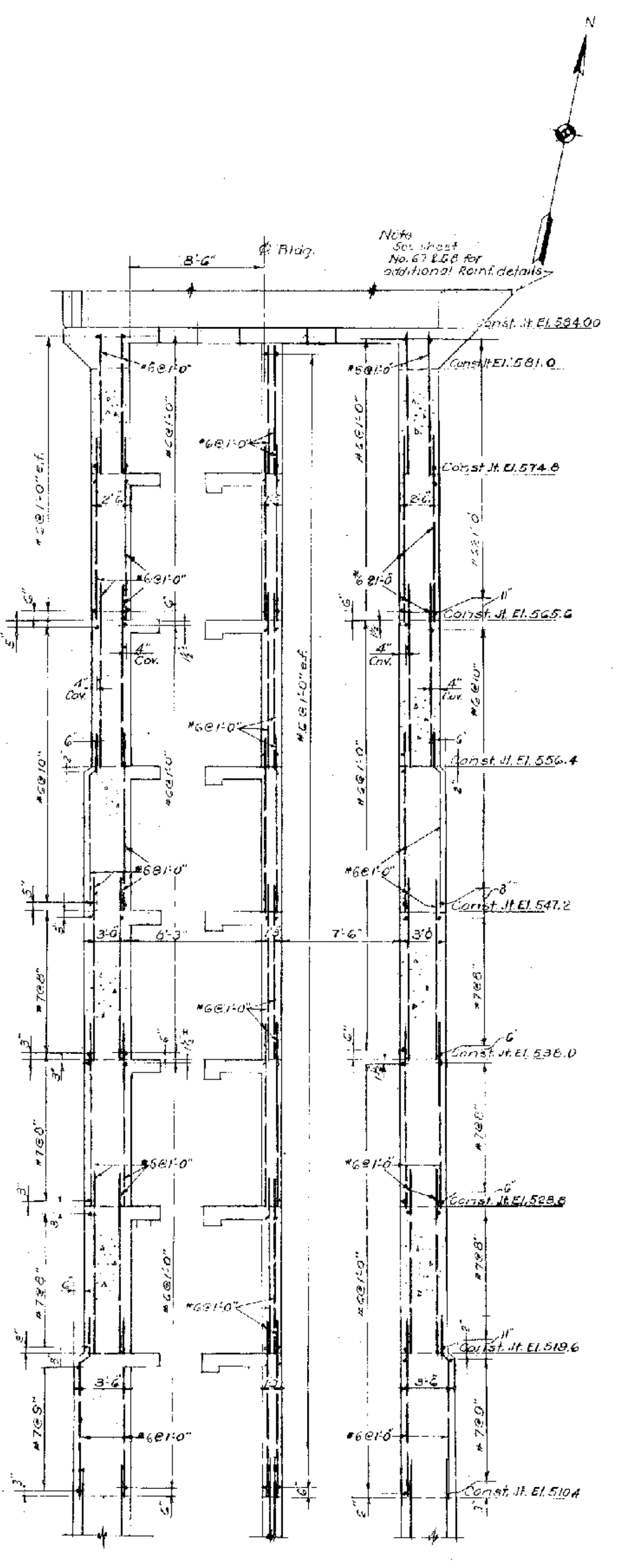
SCALE: 1" = 100'
SPEC. NO. CIV. ENG. 19-016-

DRAWING NUMBER
CT-1-5725

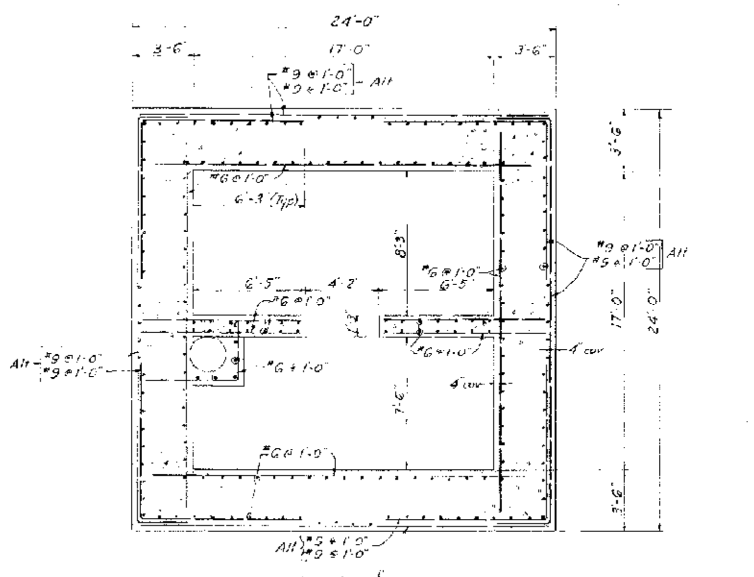
SHEET 2



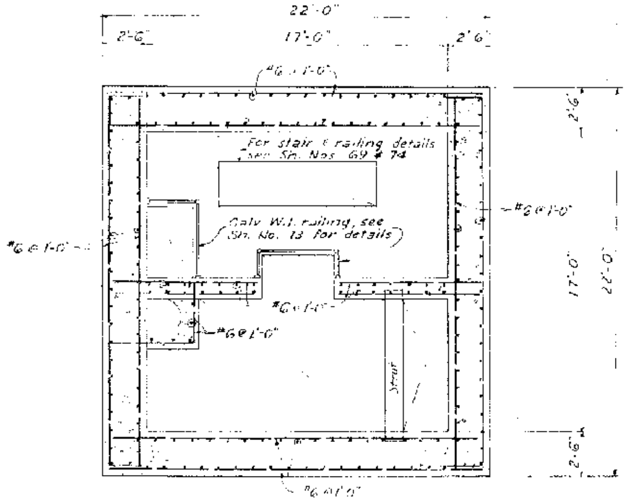
PART SECTION E/71
SCALE ¼"=1'-0"



PART SECTION F/71
SCALE ¼"=1'-0"



SECTION G/71
SCALE ¼"=1'-0"
Typical Between El. 482.8 - El. 501.2


22'-0"
17'-0"
2'-6"
#6@1'-0"
For stair & railing details see Sh. Nos. 69 & 74
Galv. W.I. railing, see Sh. No. 13 for details

SECTION D/71
SCALE 1/4"=1'-0"

NOTE: Arrangement of steel is typical between El. 501.2 and El. 584.0. For size see Vertical Sections.

NOTES:
For General Notes applying to this sheet except for concrete payment item numbers, see Sh. No. 49
Payment for concrete shown on this sheet will be made under the following item numbers:—
Below El 482.0 Item No 57
Between El 482.0 & El 581.0 Item No 58
Above El 581.0 Item No 59

GRAPHIC SCALE
¼"=1'-0" 4 0 4' 8'
1"=1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

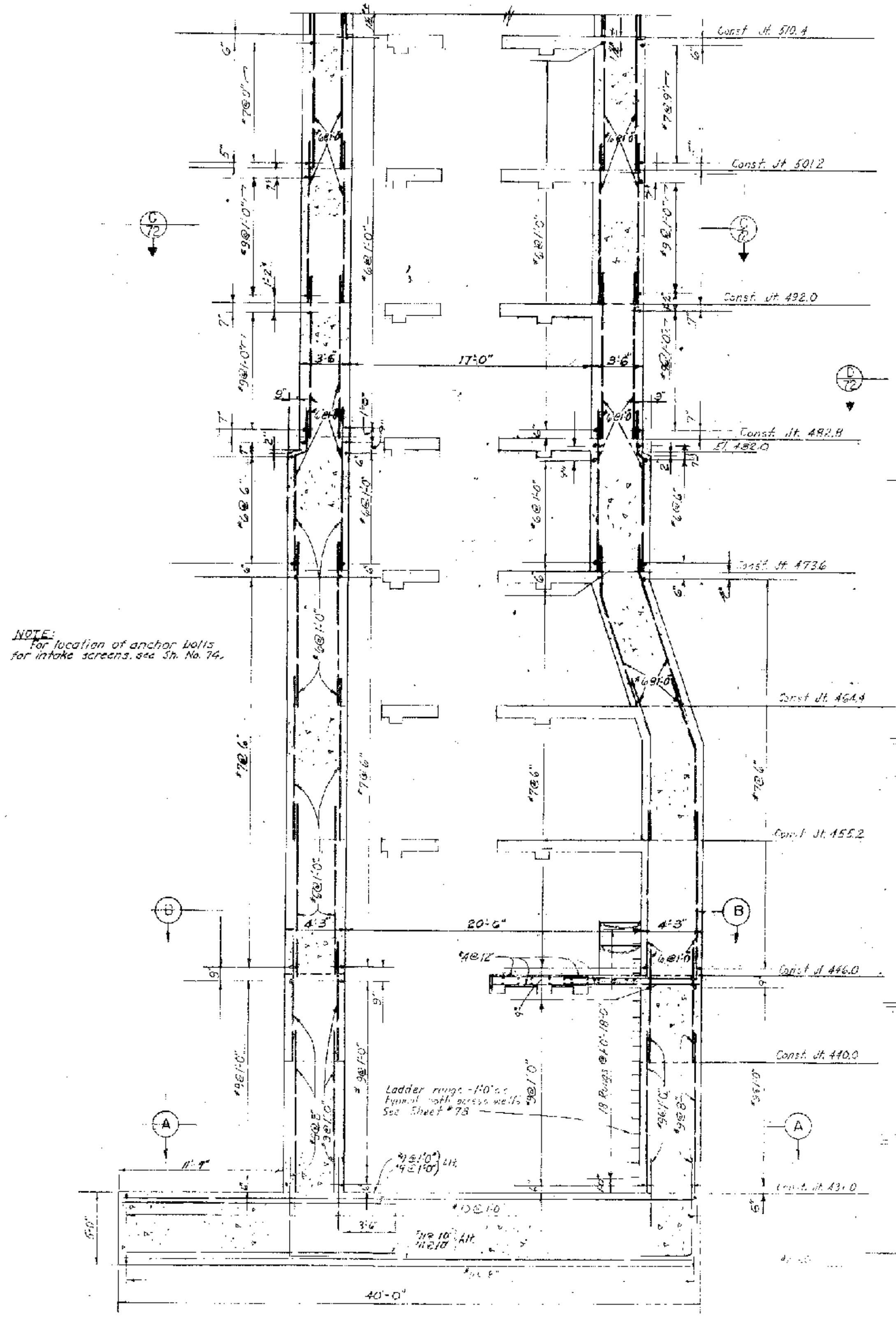
DES. BY R.A.K. DR. BY A.J.Z. CH. BY
SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
STRUCTURAL
VERTICAL SECTIONS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

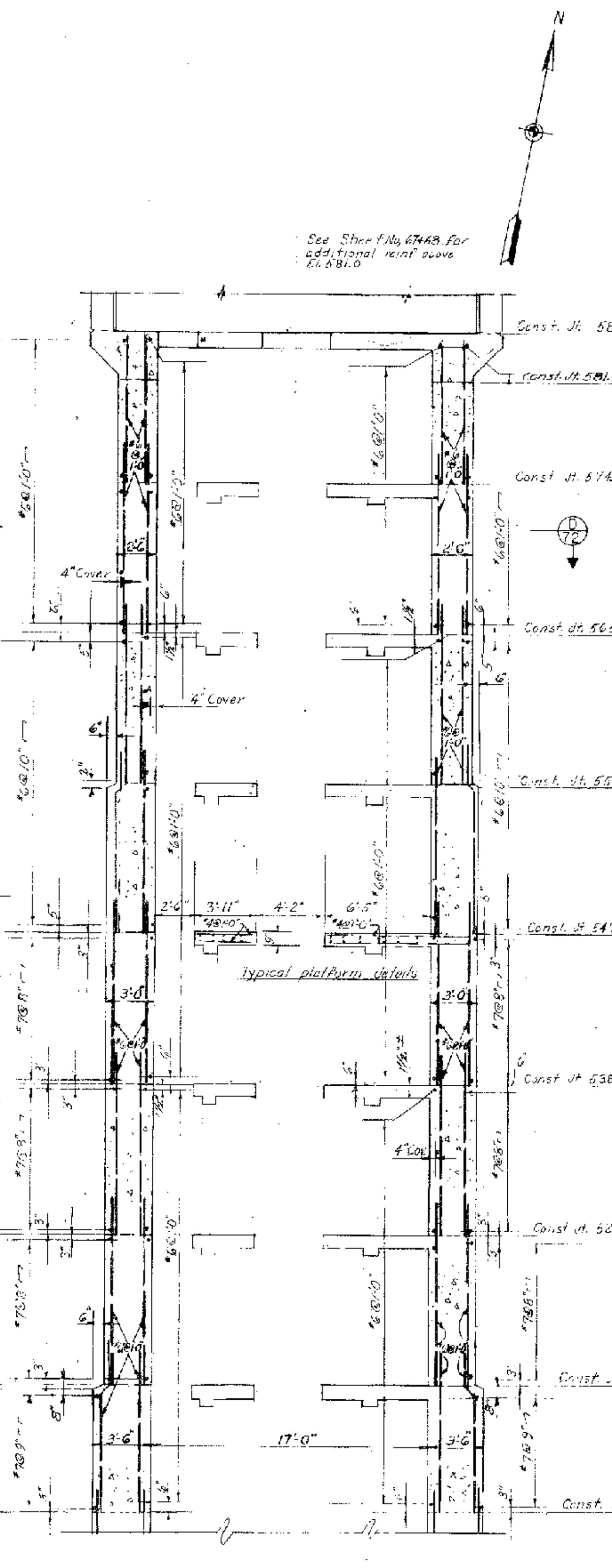
SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5778
SHEET 72

CORPS OF ENGINEERS U. S. ARMY

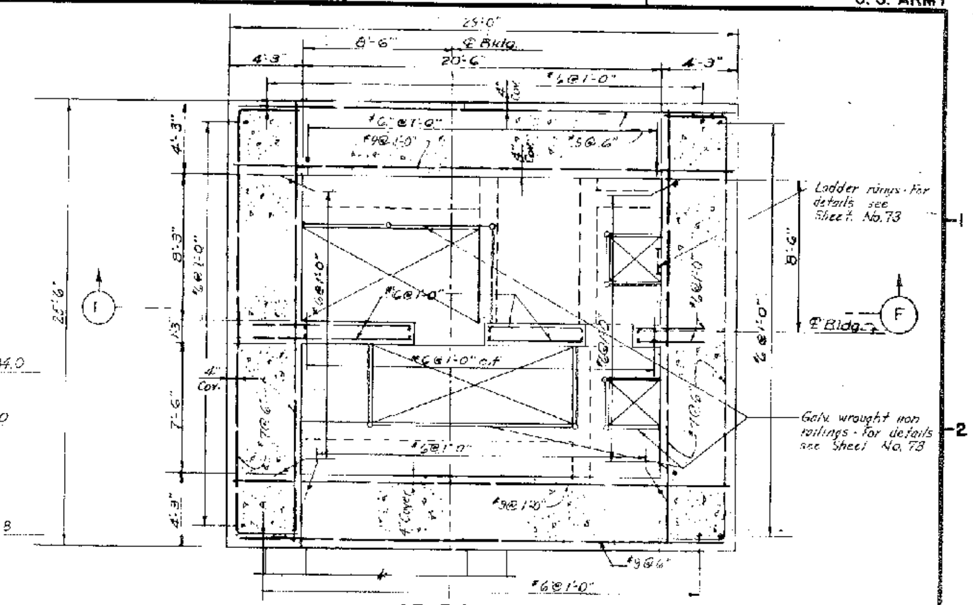


NOTE: For location of anchor bolts for intake screens, see Sh. No. 74.

PART SECTION I-F

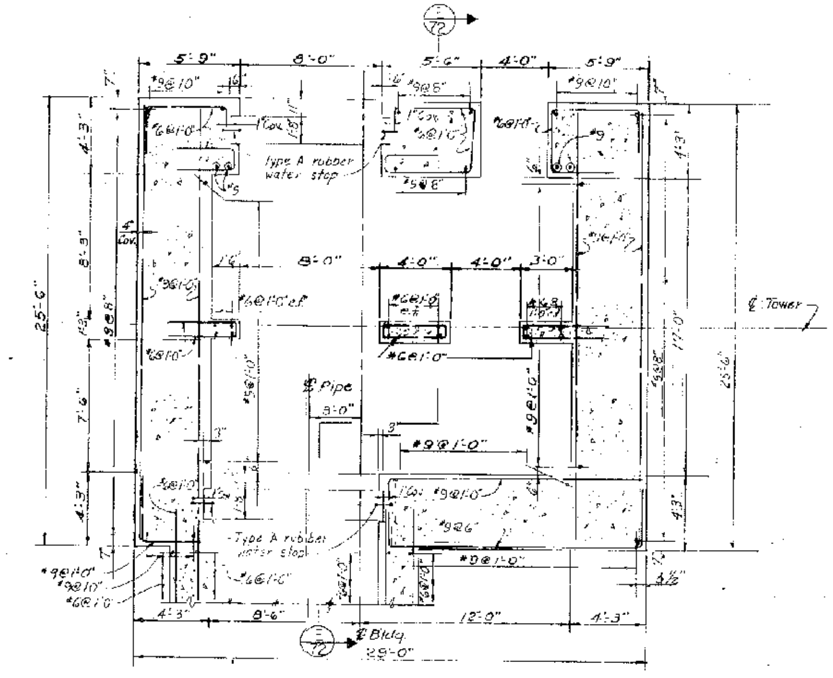


PART-SECTION F F



25'-0"
8'-6"
℄ Bldg.
20'-6"
4'-3"
#4@1'-0"
#6@1'-0"
#9@1'-0"
#9@6"
#6@1'-0" c.f.
4" Cov.
Ladder rungs - For details see Sheet No. 73
Galv. wrought iron railings - for details see Sheet No. 73
℄ Bldg.
F
I

SECTION B B



SECTION A-A

NOTES

For general notes applying to this sheet except for concrete payment item numbers, see Sheet No. 49

Payment for concrete shown on this sheet will be made under the following item numbers - Below El. 482 Item No. 57 between El. 482 and El. 501 Item 56 - Above El. 501 Item 59

For details of rubber water stops see Sheet No. 80. Pour concrete for plug tight against joint without mastic coating

REVISION	DATE	DESCRIPTION

GRAPHIC SCALES

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R.A.K. DR. BY A.J.Z. CK. BY

SUBMITTED W. E. Whittaker
CHIEF, STRUCT. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
STRUCTURAL
VERTICAL SECTIONS NO. 1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

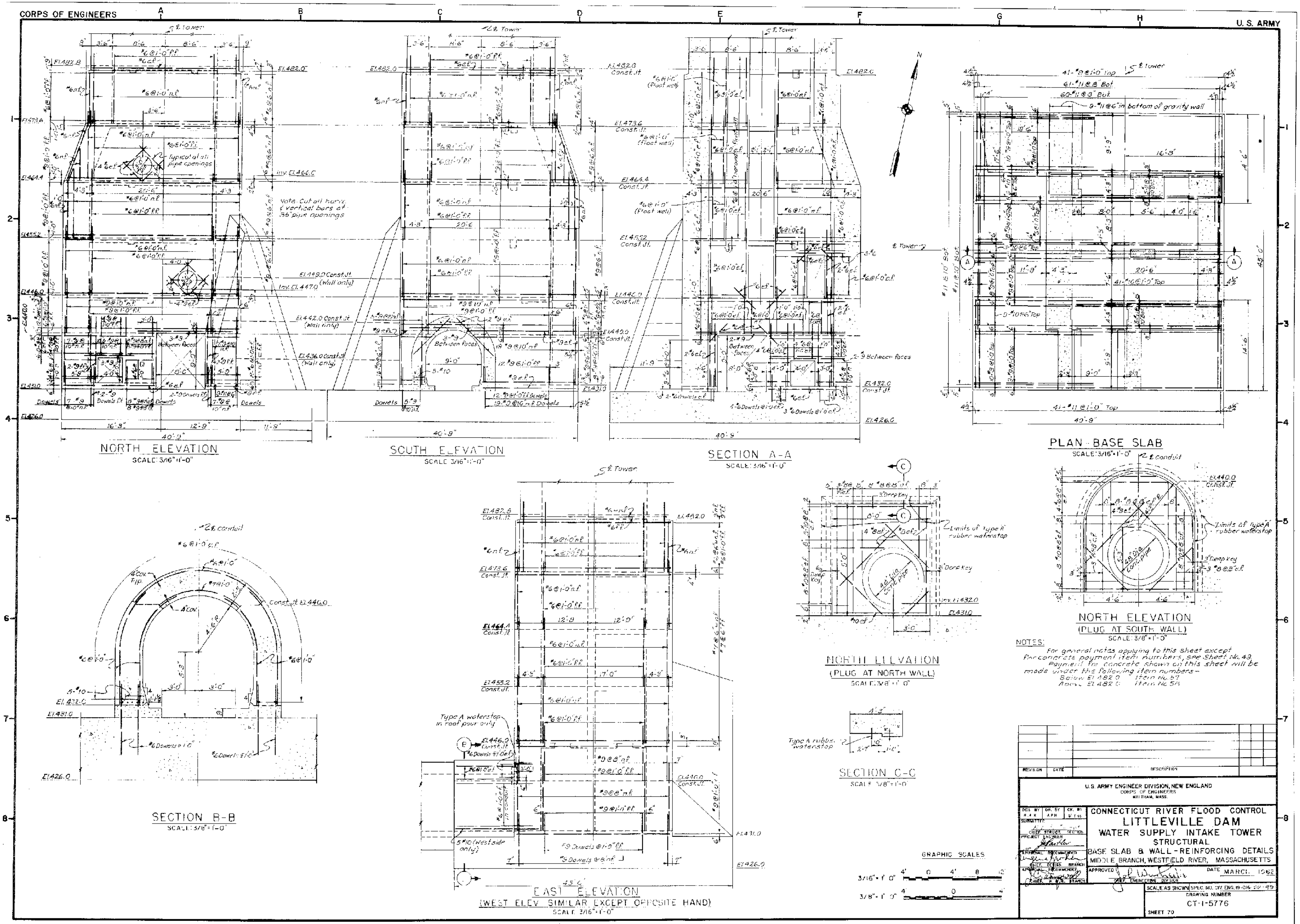
APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5777

SHEET 71



NOTES:

For general notes applying to this sheet except for concrete payment item numbers, see Sheet No. 43.

Payment for concrete shown on this sheet will be made under the following item numbers–

Below El. 482.0   Item No. 57
Above El. 482.0   Item No. 58

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

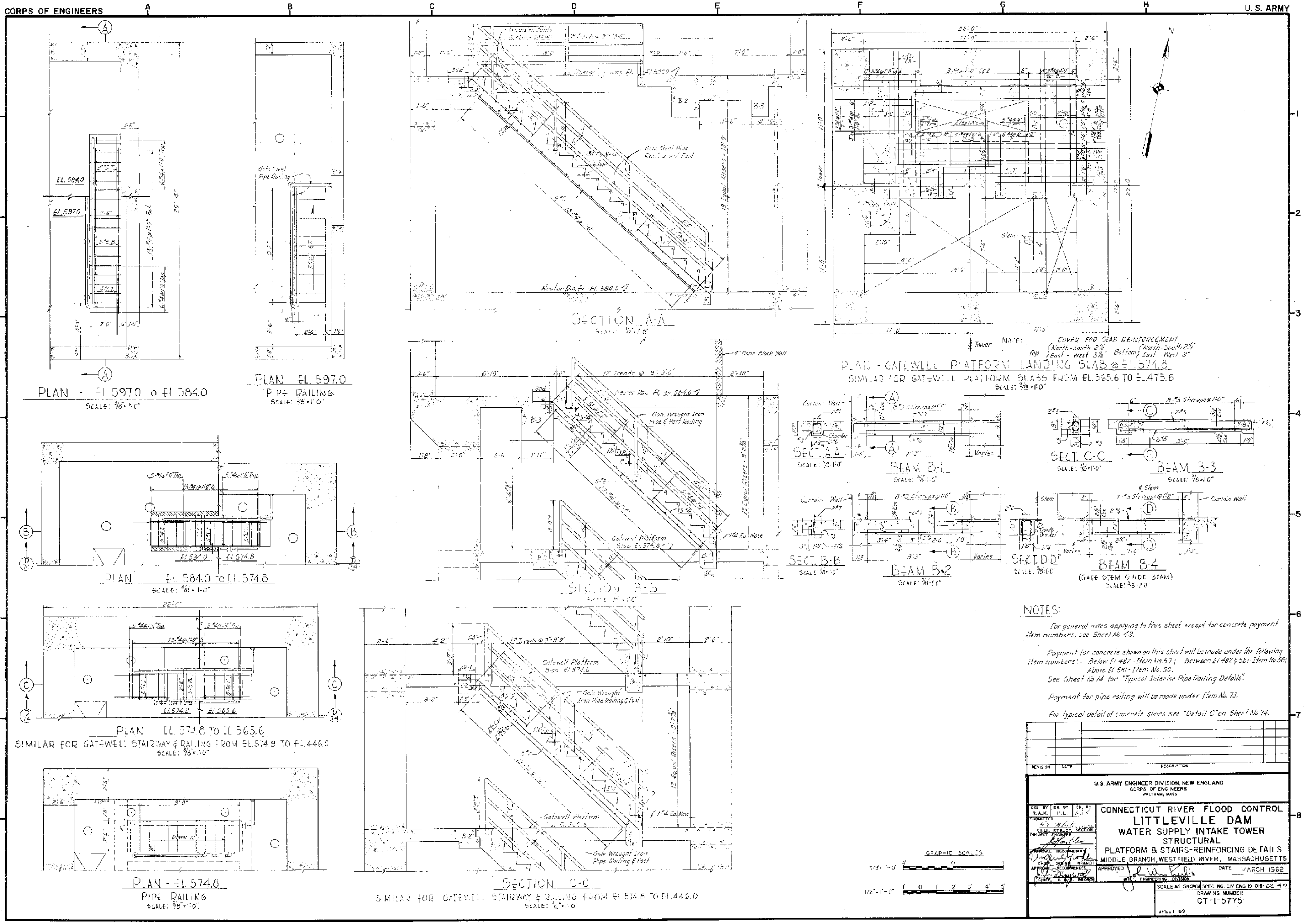
DES. BY	DR. BY	CK. BY
R.A.K.	J.P.H.	V.T.W.

SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
STRUCTURAL
BASE SLAB & WALL-REINFORCING DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5776
SHEET 70



NOTES:

For general notes applying to this sheet except for concrete payment item numbers, see Sheet No. 43.

Payment for concrete shown on this sheet will be made under the following item numbers:- Below El 482 - Item No. 57; Between El 482 & 581 - Item No. 58; Above El 581 - Item No. 59.

See Sheet No 14 for "Typical Interior Pipe Railing Details".

Payment for pipe railing will be made under Item No. 73.

For typical detail of concrete stairs see "Detail C" on Sheet No. 74.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
R.A.K.	R.L.	A.J.Y.

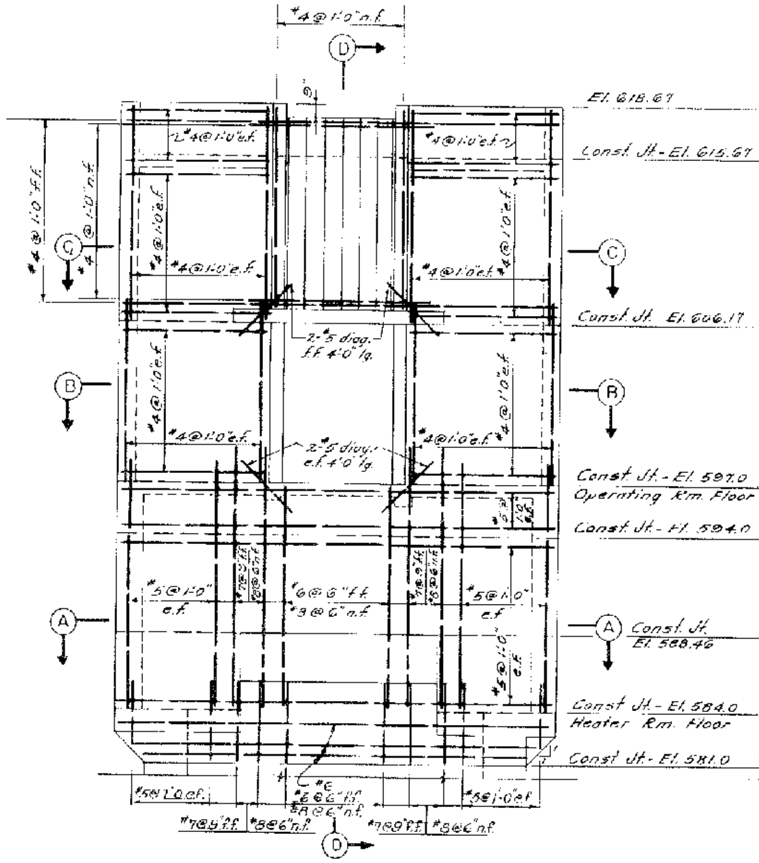
SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, E. & M. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
STRUCTURAL
PLATFORM & STAIRS-REINFORCING DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

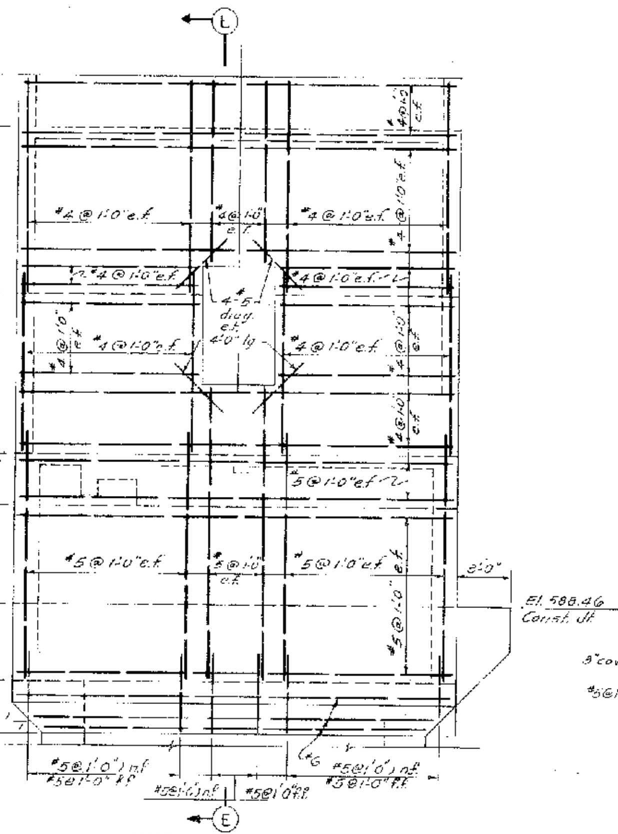
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5775
SHEET 69

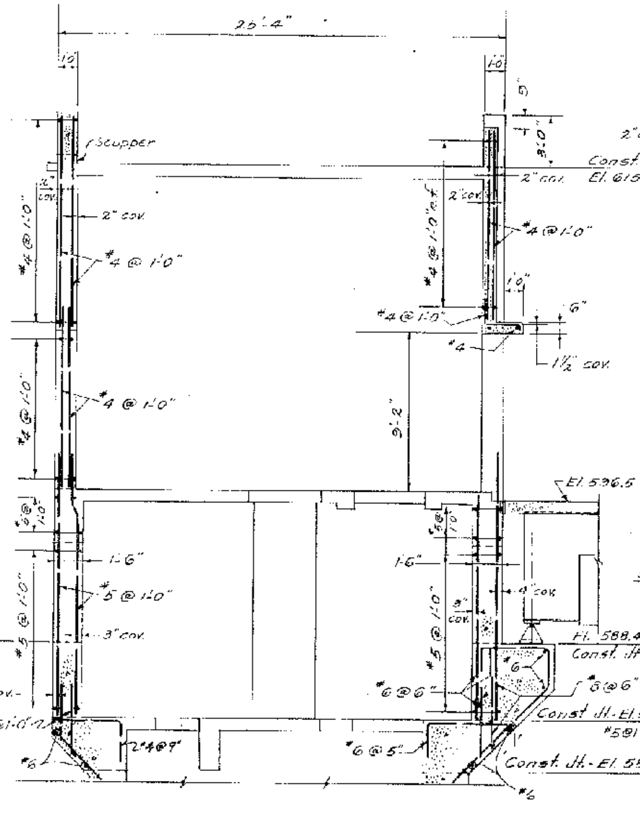
CORPS OF ENGINEERS U. S. ARMY



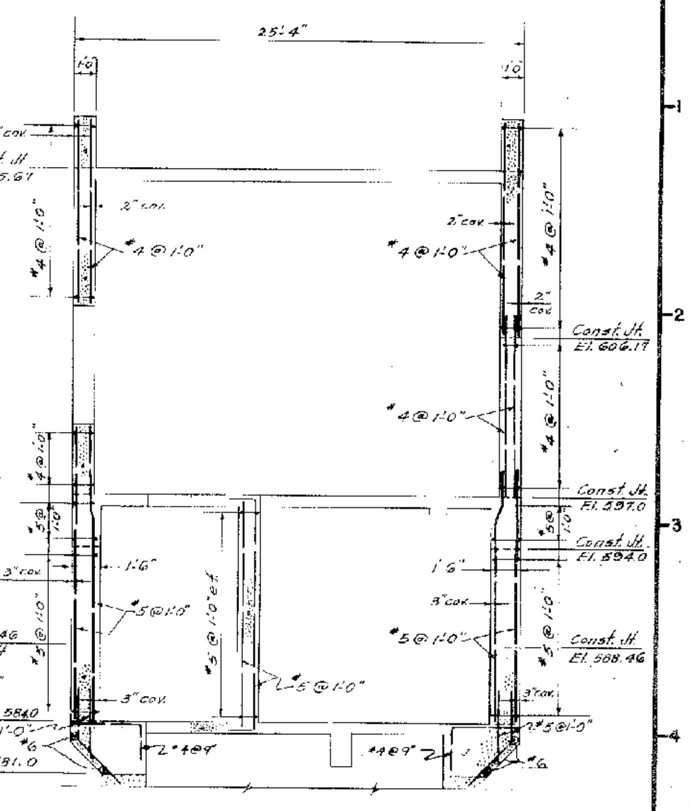
FRONT ELEVATION



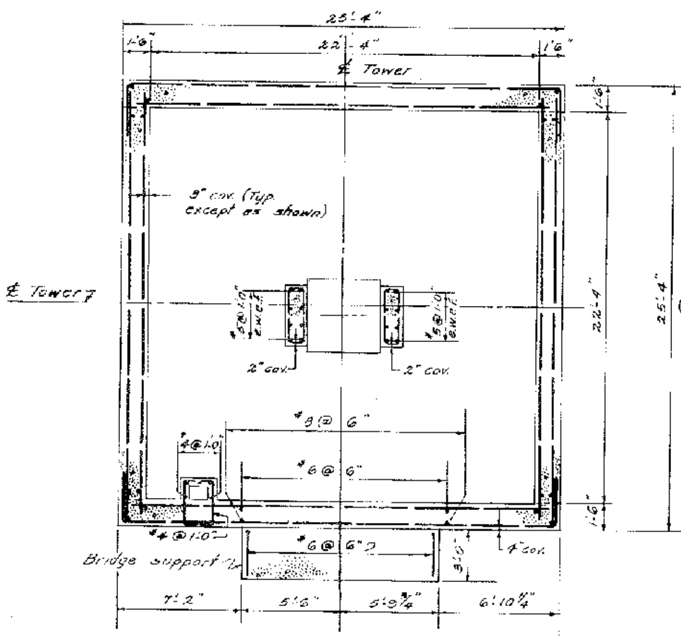
SIDE ELEVATION



SECTION D—D

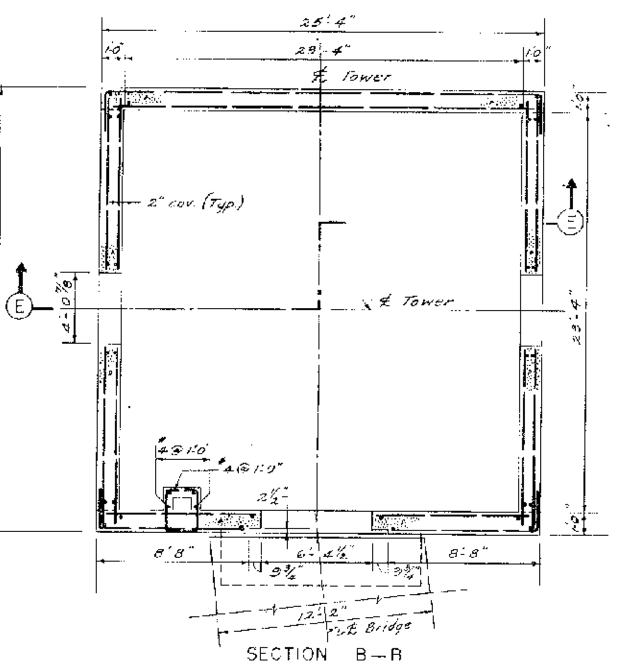


SECTION E—E



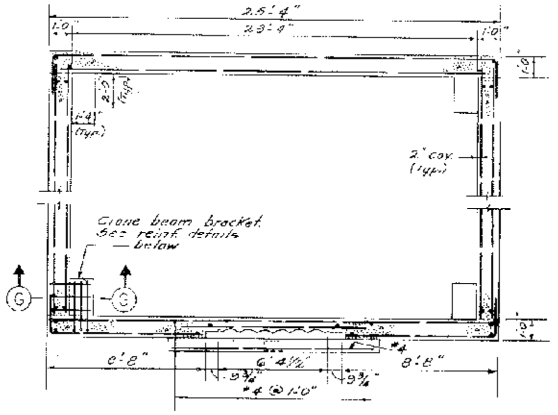
SECTION A—A

All reinf. #5@1'0"e.w.e.f. except as noted



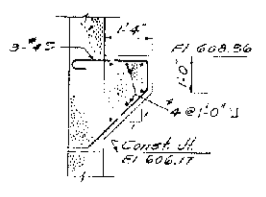
SECTION B—B

All reinf. #4@1'0"e.w.e.f.



SECTION C—C

All reinf. #4@1'0"e.w.e.f.

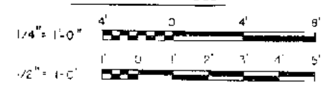


SECTION G—G

CRANE BEAM BRACKET DETAILS

SCALE ½"=1'-0"

GRAPHIC SCALES



NOTES:

For general notes applying to this sheet, except concrete payment items, see Sheet No. 49.

Payment for concrete shown on this sheet will be made under the following item numbers —

El. 482.0 – El. 581.0 Item No. 58

Above El. 581.0 Item No. 59

All horizontal construction joints shown on this sheet shall be flush joints except joint at El. 597.0. For details of this joint see architectural details.

For architectural details see sheet Nos. 63, 64 and 65.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R.K. DR. BY C.M.A. CK. BY

SUBMITTED
CHIEF, STRUCT. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
STRUCTURAL—SUPERSTRUCTURE
ELEVATIONS & SECTIONS-REINFORCING DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

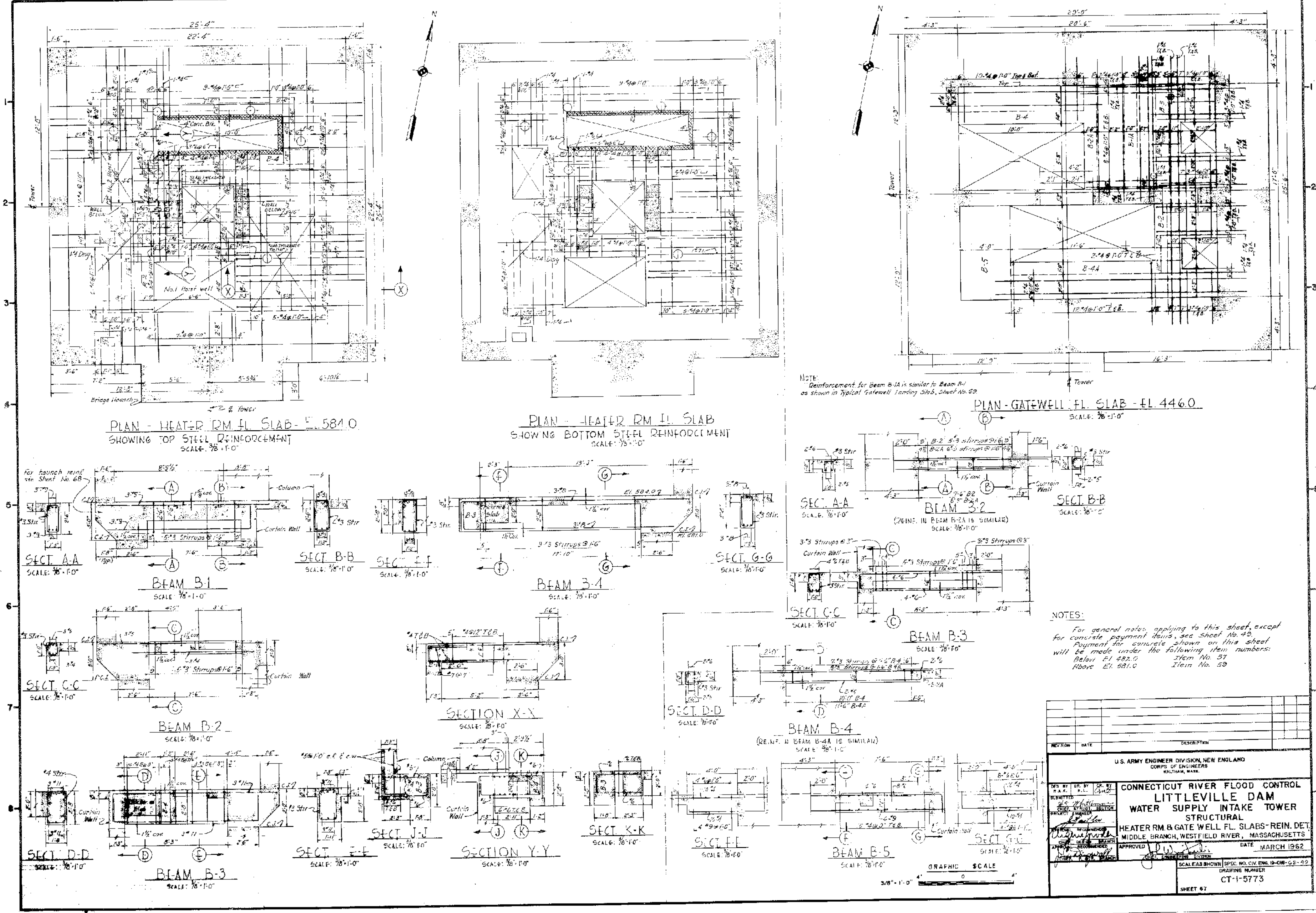
APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE: 1/4"=1'-0" SPEC. NO. CIV. ENG 19-016-62-19

DRAWING NUMBER
CT-1-5774

SHEET 68



NOTE:
Reinforcement for Beam B-1A is similar to Beam B-1 as shown in Typical Gatewell Landing Slab, Sheet No. 69.

NOTES:

For general notes applying to this sheet, except for concrete payment items, see Sheet No. 49.

Payment for concrete shown on this sheet will be made under the following item numbers:

Below El. 482.0 Item No. 57
Above El. 581.0 Item No. 59

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R.A.K. DR. BY H.L. CK. BY

SUBMITTED
CHIEF, STRUCT. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
STRUCTURAL
HEATER RM. & GATE WELL FL. SLABS-REIN. DET.
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

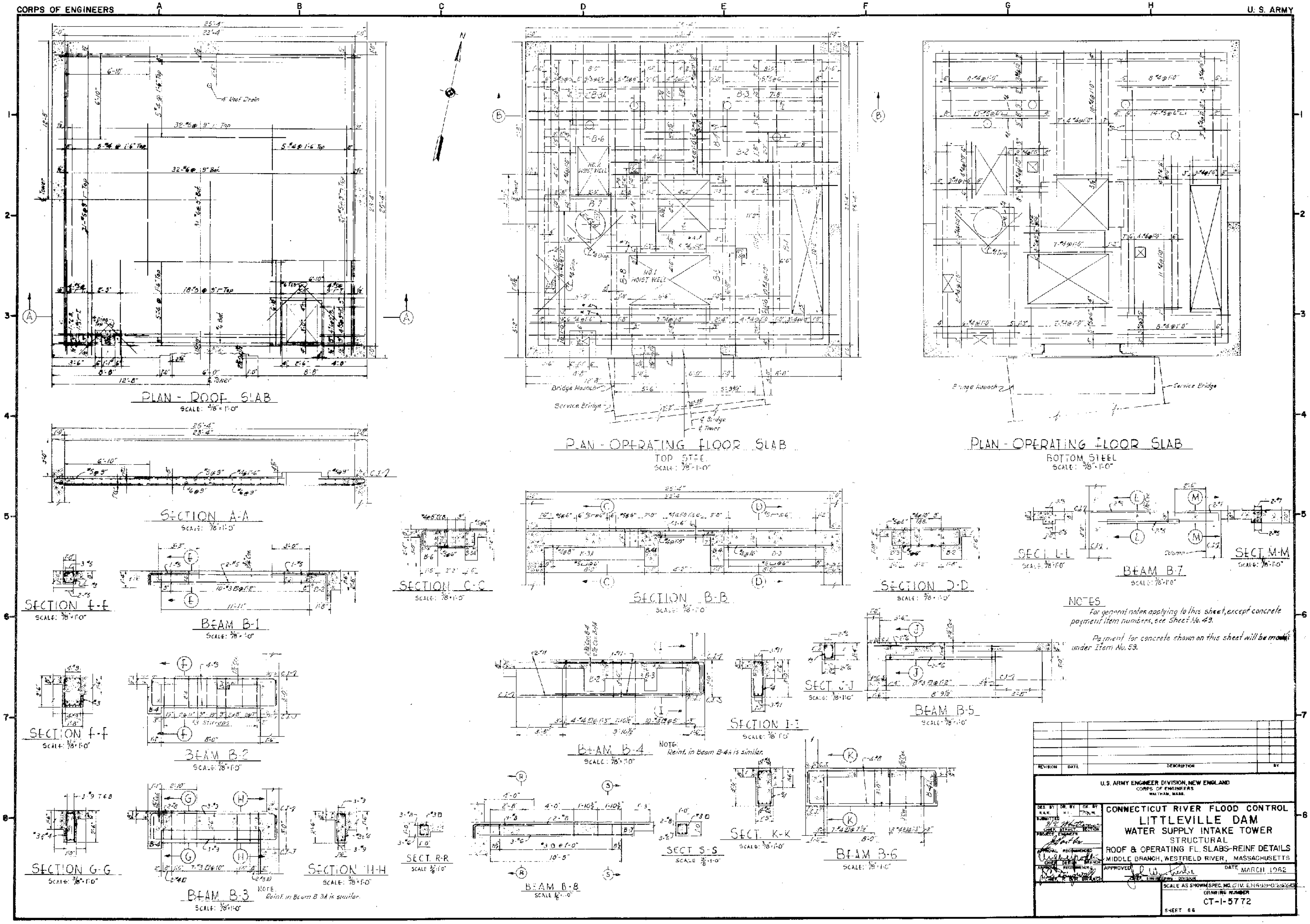
DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5773

SHEET 67

CORPS OF ENGINEERS U. S. ARMY



NOTES

For general notes applying to this sheet, except concrete payment item numbers, see Sheet No. 49.

Payment for concrete shown on this sheet will be made under Item No. 59.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R.A.K. DR. BY H.L. CK. BY P.N.M.

SUBMITTED H.E. Whittemore
CHIEF, STRUCT. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, P. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
STRUCTURAL
ROOF & OPERATING FL. SLABS-REINF. DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

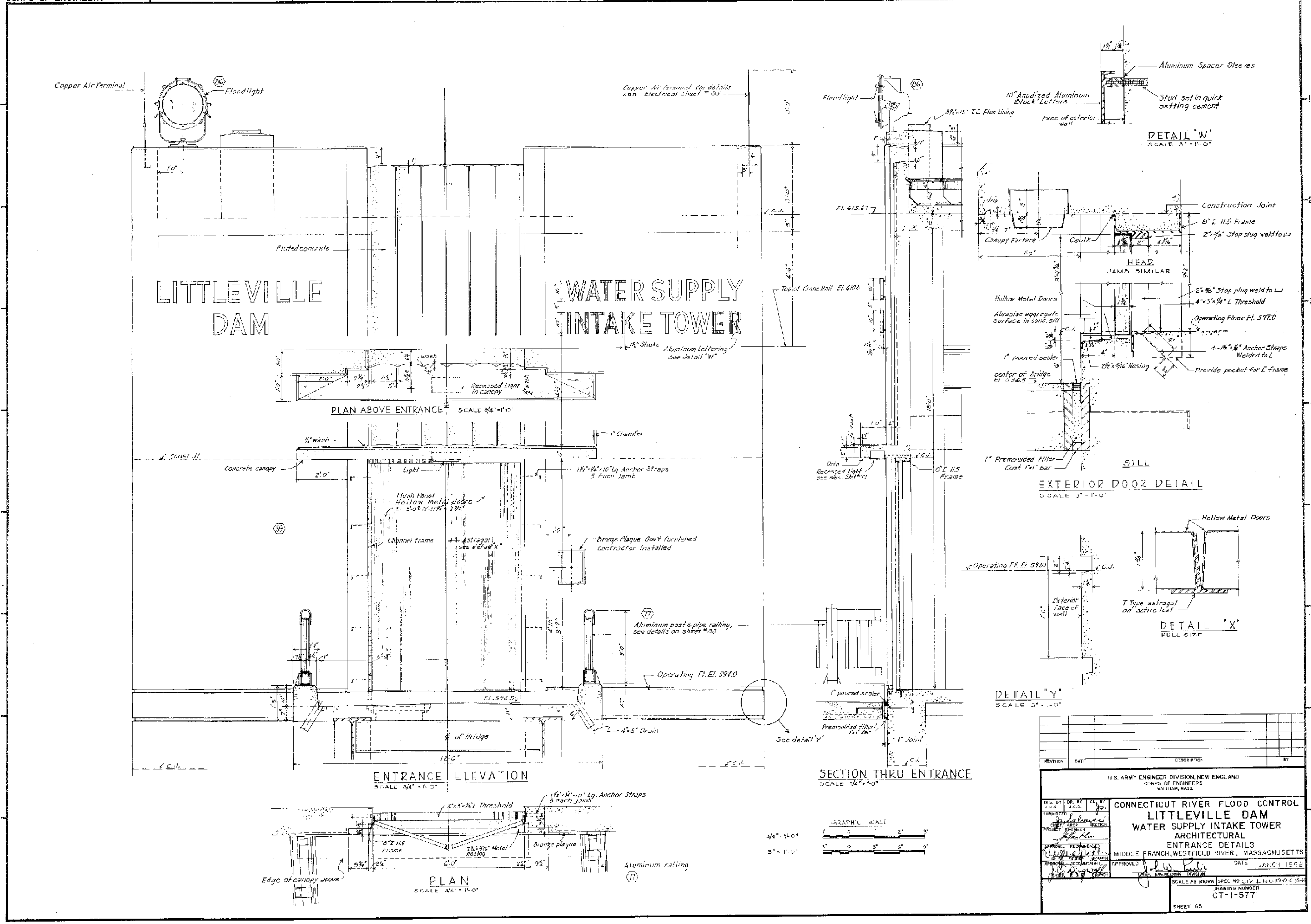
APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE AS SHOWN SPEC. NO. CIV. ENG-19-016-62-25

DRAWING NUMBER
CT-1-5772

SHEET 66


CORPS OF ENGINEERS
U. S. ARMY
A
B
C
D
E
F
G
H
1
2
3
4
5
6
7
8
Copper Air Terminal
Floodlight
(36)
Copper Air Terminal for details see Electrical Sheet # 85
Fluted concrete
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
1½" Stroke
Aluminum Lettering See detail "W"
Top of Crane Rail El. 610.5
El. 615.67
PLAN ABOVE ENTRANCE SCALE 3/4"=1'-0"
wash
Recessed Light in canopy
1" Chamfer
½" wash
Const. Jt.
Concrete canopy
Light
1½"×¼"×10" Lg. Anchor Straps 5 Each Jamb
Flush Panel Hollow metal doors 2- 3'-0" × 8'-11⅝" × 1¾"
Channel frame
Astragal See detail "X"
Bronze Plaque Gov't furnished Contractor installed
(59)
(77)
Aluminum post & pipe railing, see details on sheet # 80
Operating Fl. El. 597.0
El. 596.5
4"×8" Drain
℄ of Bridge
12'-6"
℄ C.J.
See detail "Y"
ENTRANCE ELEVATION SCALE 3/4"=1'-0"
1½"×¼"×10" Lg. Anchor Straps 5 each Jamb
4"×3"×¼" L Threshold
8" ⊏ 11.5 Frame
2½"×5/16" Metal Nosing
Bronze plaque
Edge of canopy above
Aluminum railing
(77)
PLAN SCALE 3/4"=1'-0"
Floodlight
(36)
8½"×13" T.C. Flue Lining
Drip
Recessed light see elec. Sht # 71
8" ⊏ 11.5 Frame
C.J.
1" poured sealer
Premoulded Filler 1"×1" Bar
1" Joint
C.J.
SECTION THRU ENTRANCE SCALE 3/4"=1'-0"
GRAPHIC SCALE
3/4"=1'-0"
3"=1'-0"
10" Anodized Aluminum Block Letters
Face of exterior wall
Aluminum Spacer Sleeves
Stud set in quick setting cement
DETAIL "W" SCALE 3"=1'-0"
Drip
Canopy Fixture
Caulk
Construction Joint
8" ⊏ 11.5 Frame
2"×⅝" Stop plug weld to ⊏
HEAD
JAMB SIMILAR
Hollow Metal Doors
Abrasive aggregate surface in conc. sill
C.J.
2"×⅝" Stop plug weld to ⊏
4"×3"×¼" L Threshold
Operating Floor El. 597.0
4 - 1½"×¼" Anchor Straps Welded to L
Provide pocket for ⊏ frame
2½"×5/16" Nosing
1" poured sealer
center of Bridge El. 596.5
1" Premoulded Filler Conc. 1"×1" Bar
SILL
EXTERIOR DOOR DETAIL SCALE 3"=1'-0"
Hollow Metal Doors
T Type astragal on active leaf
DETAIL "X" FULL SIZE
Operating Fl. El. 597.0
C.J.
Exterior face of wall
DETAIL "Y" SCALE 3"=1'-0"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

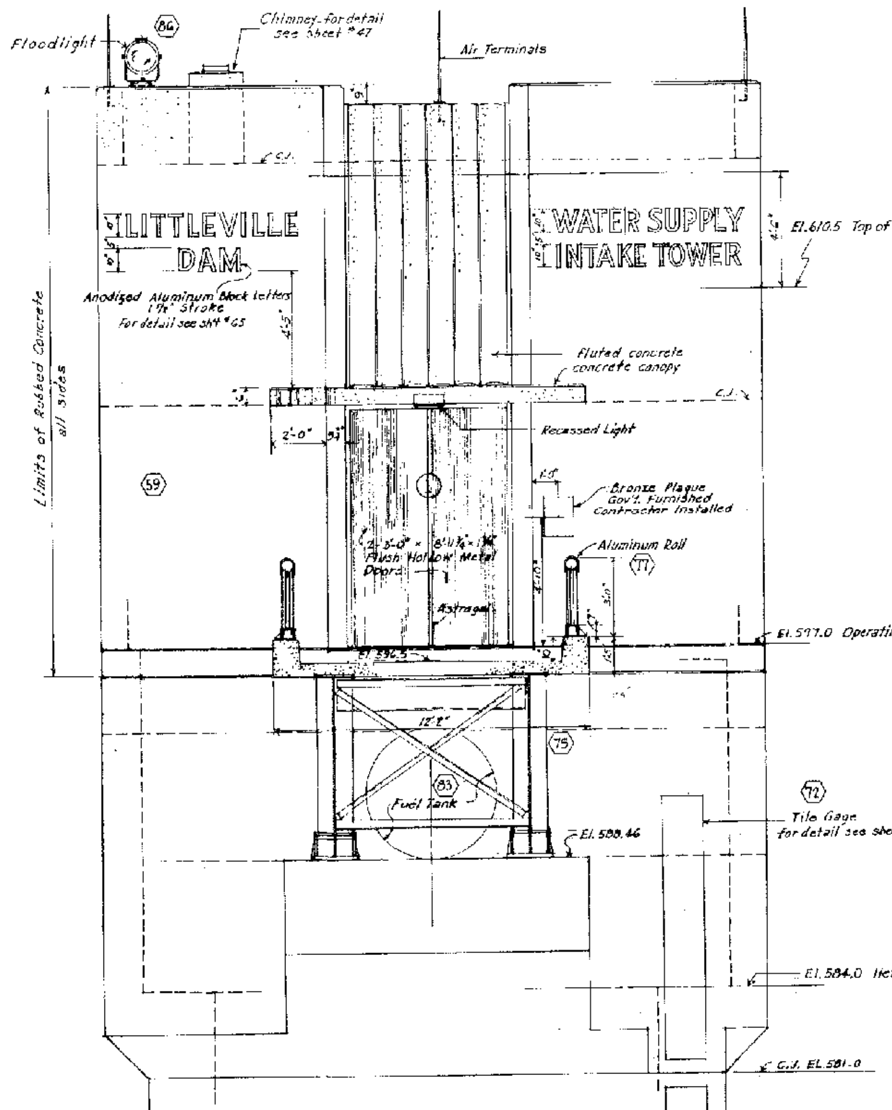
DES. BY J.C.K. | DR. BY J.C.G. | CK. BY J.D.

SUBMITTED
CHIEF, ARCH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CH. OF DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, E. & S. BRANCH

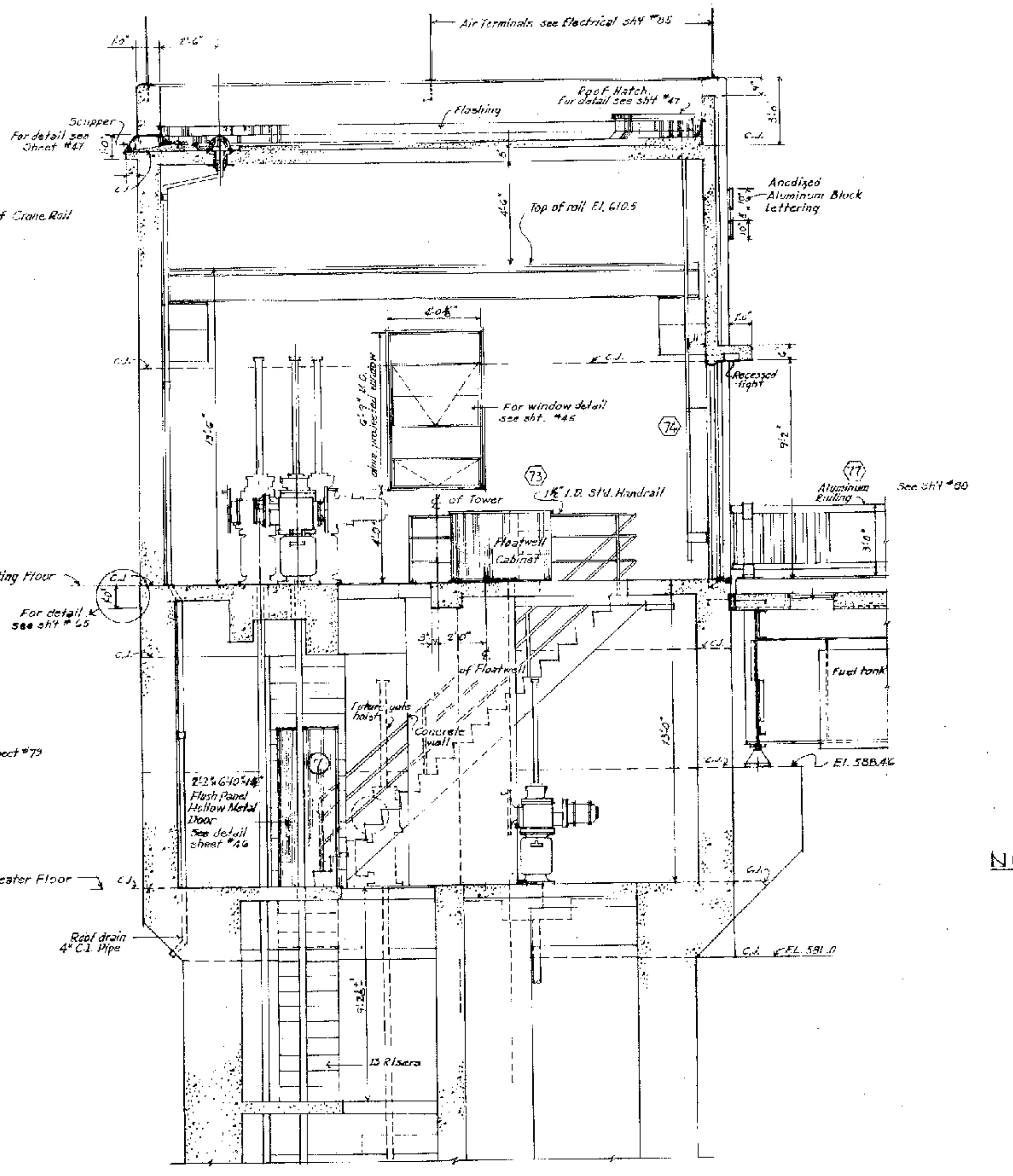
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
ARCHITECTURAL
ENTRANCE DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED John W. Rudis
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-
DRAWING NUMBER
CT-1-5771
SHEET 65


Floodlight
86
Chimney-for detail see Sheet #47
Air Terminals
LITTLEVILLE DAM
Anodized Aluminum Block letters 1¾" Stroke For detail see sht #65
WATER SUPPLY INTAKE TOWER
El. 610.5 Top of Crane Rail
Limits of Rubbed Concrete all sides
Fluted concrete concrete canopy
C.J.
2'-0"
Recessed Light
59
Bronze Plaque Gov't. Furnished Contractor Installed
Aluminum Rail
77
2-3'-0" × 8'-11¾" × 1¾" Flush Hollow Metal Doors
Astragal
El. 597.0 Operating Floor
El. 596.5
12'-2"
75
83
Fuel Tank
72
Tile Gage for detail see sheet #79
El. 588.46
El. 584.0 Heater Floor
C.J. El. 581.0

ELEVATION
SCALE 3/8" = 1'-0"



SECTION (A/63)
SCALE 3/8" = 1'-0"

NOTE: For door schedule see sheet #46

GRAPHIC SCALE
3/8" = 1'-0"   0 1' 2' 3' 4' 5'   10'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
J.C.G.	J.C.G.	

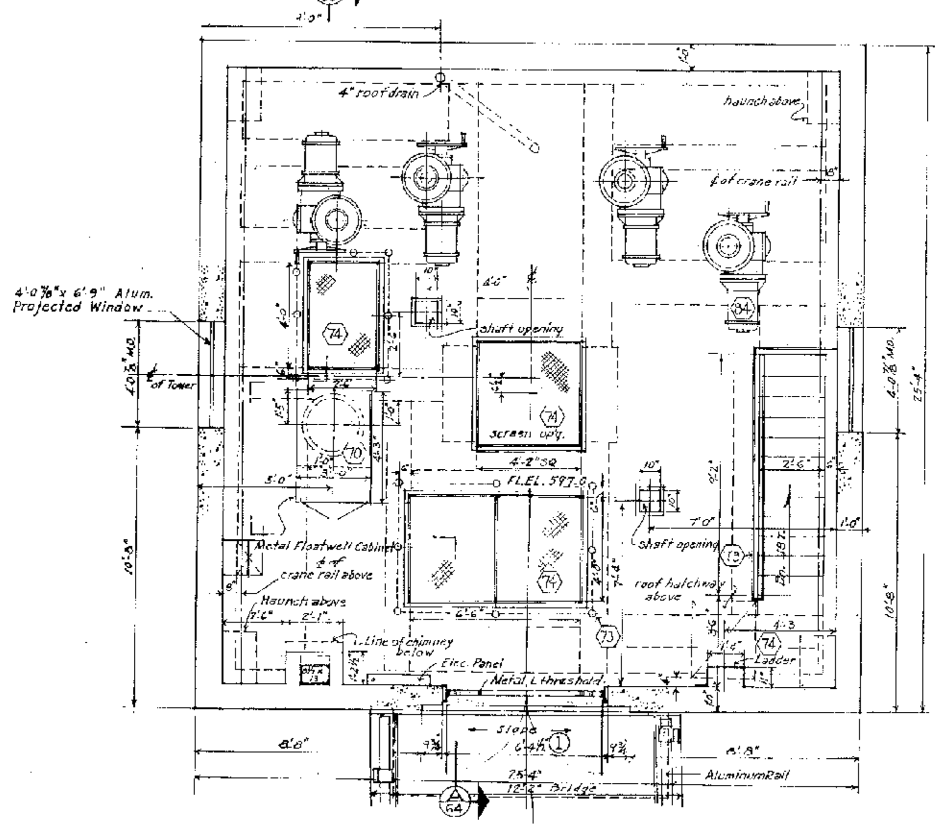
SUBMITTED
CHIEF, ARCH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, E.&S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY - INTAKE TOWER
ARCHITECTURAL
ELEVATION AND SECTION
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5770
SHEET 64

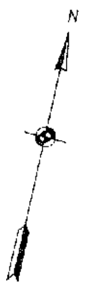
CORPS OF ENGINEERS A B C D E F G H U.S. ARMY

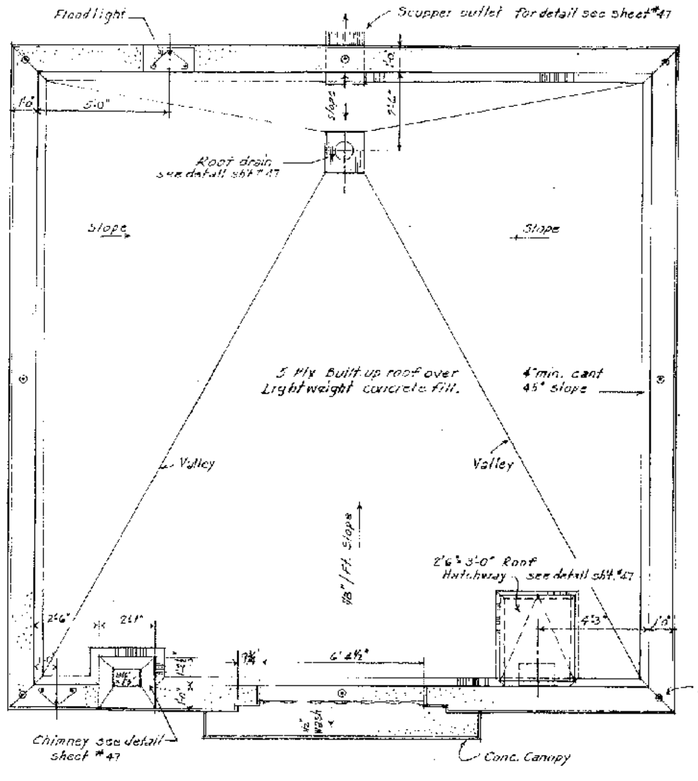


OPERATING FLOOR PLAN

SCALE 3/8" = 1'-0"

← ℄ of Bridge

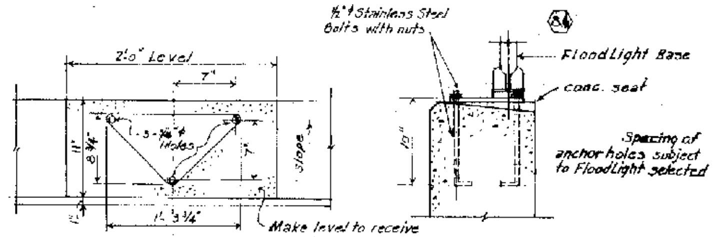




Floodlight
Scupper outlet for detail see sheet #47
Roof drain see detail sht #47
Slope
5 Ply Built up roof over Lightweight concrete fill.
4" min. cant 45° slope
Valley
1/8"/Ft. Slope
2'-6" x 3'-0" Roof Hatchway see detail sht. 47
Air terminal see Elec. sht. No. 25
Chimney see detail sheet #47
Conc. Canopy

ROOF PLAN

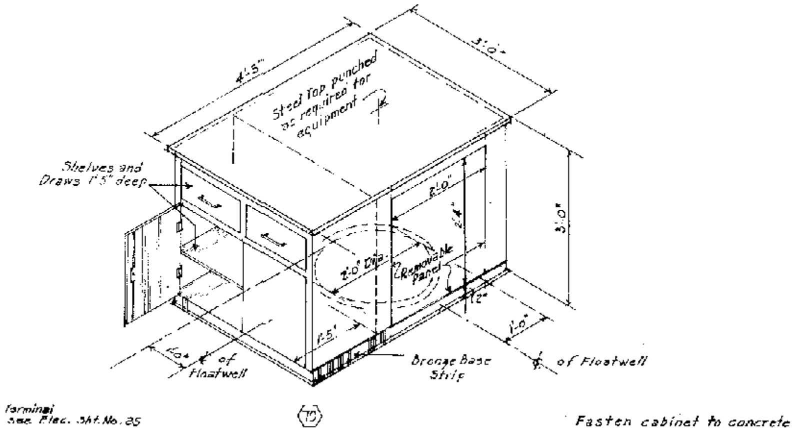
SCALE 3/8" = 1'-0"



2'-0" Level
7"
3-⅝" ∅ Holes
1'-3¼"
Make level to receive Flood Light Base
½" ∅ Stainless Steel Bolts with nuts
Flood Light Base
conc. seat
Spacing of anchor holes subject to Flood Light selected
10"
PLAN
SECTION

FLOOD LIGHT ANCHORAGE

SCALE 1½" = 1'-0"

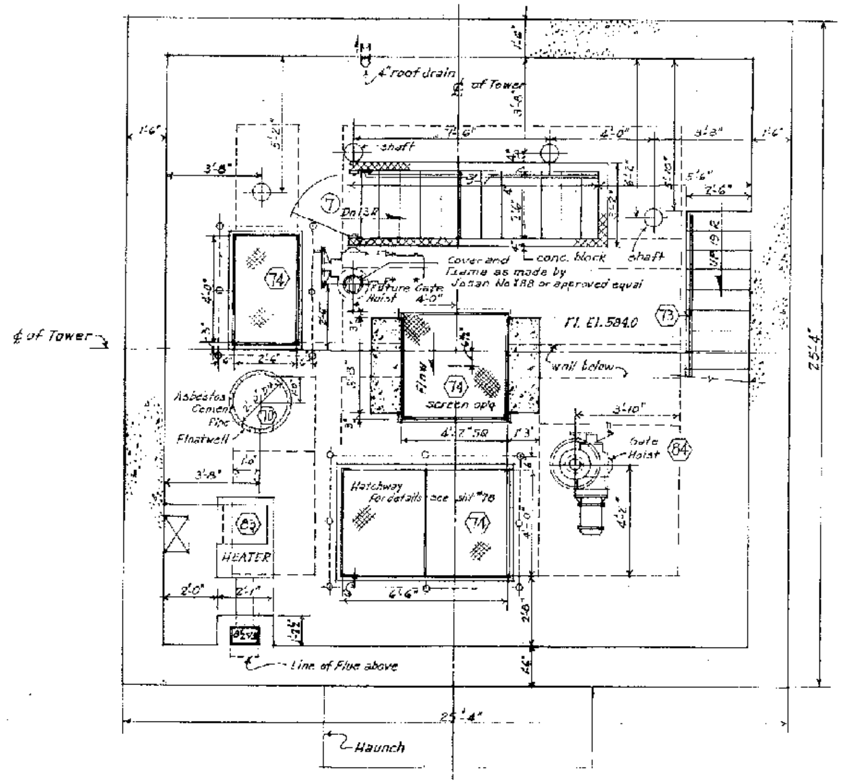


4'-5"
3'-0"
Steel top punched as required for equipment
Shelves and Draws 1'-3" deep
2'-0" Dia. Removable Panel
Bronze Base Strip
℄ of Floatwell
72

Fasten cabinet to concrete floor by concealed L anchors

METAL CABINET OVER FLOAT WELL

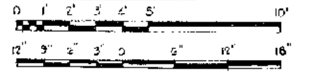
SCALE 3/4" = 1'-0"



HEATER FLOOR PLAN

SCALE 3/8" = 1'-0"

NOTE:
All items on this sheet will be paid under item No. 69 unless otherwise indicated.



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
J.C.G.	J.C.G.	J.G.

SUBMITTED
CHIEF, ARCH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & R. BRANCH

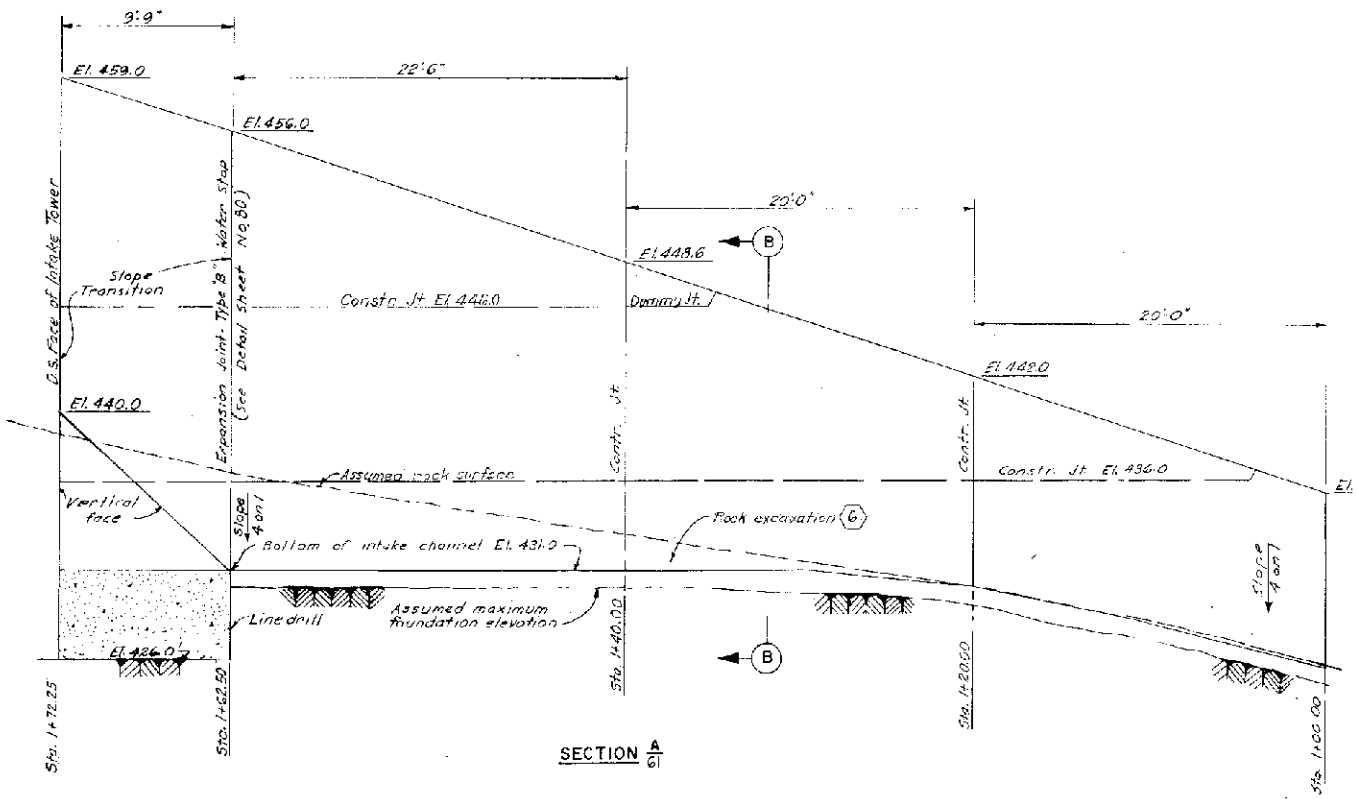
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY - INTAKE TOWER
ARCHITECTURAL
PLANS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 9-016-62-19
DRAWING NUMBER
CT-1-5769
SHEET 63 K

CORPS OF ENGINEERS

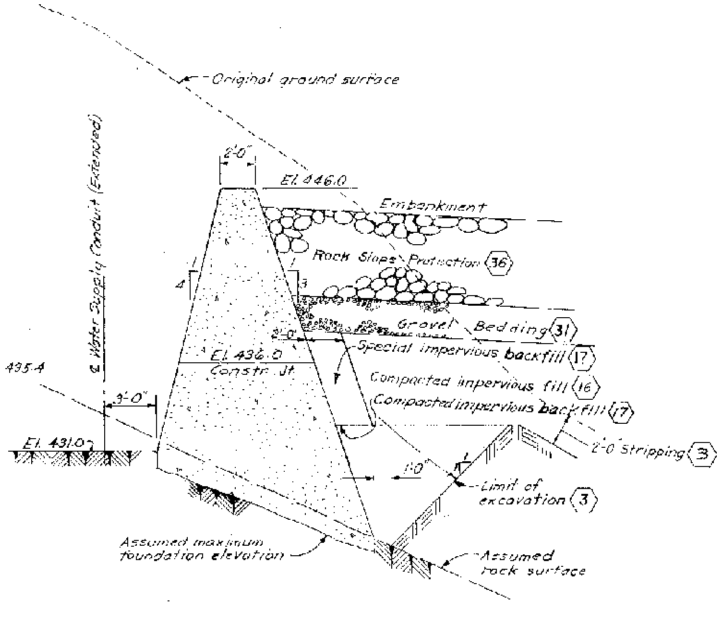
U. S. ARMY



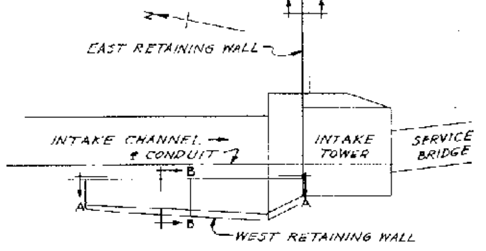
SECTION $\frac{A}{61}$

WEST RETAINING WALL

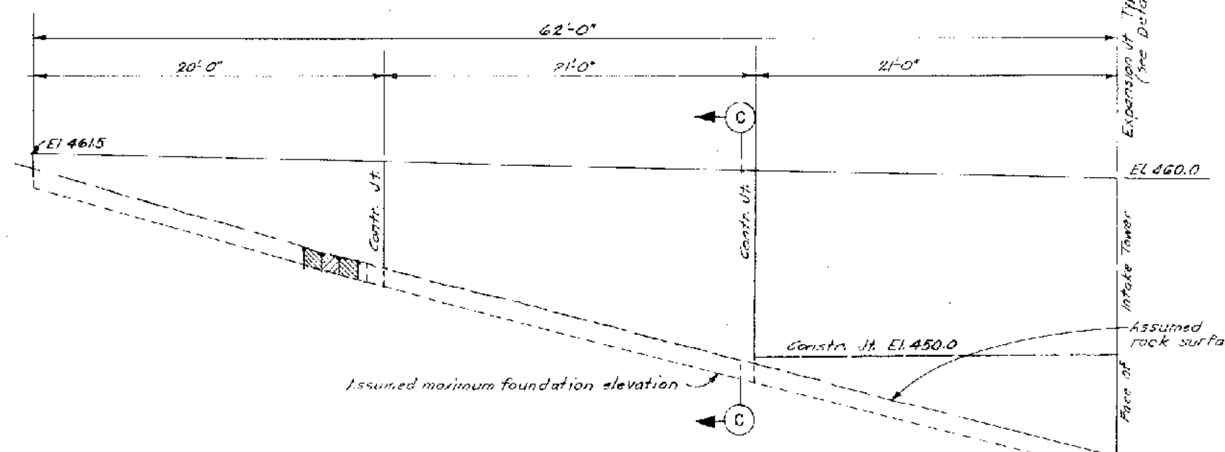
SCALE 1/4" = 1'-0"


Original ground surface
℄ Water Supply Conduit (Extended)
2'-0"
El. 446.0
Embankment
Rock Slope Protection ⟨36⟩
4
1
3
1
Gravel Bedding ⟨31⟩
2'-0"
Special impervious backfill ⟨17⟩
El. 436.0
Constr. Jt.
Compacted impervious fill ⟨16⟩
Compacted impervious backfill ⟨17⟩
3'-0"
El. 431.0
2'-0" Stripping ⟨3⟩
1'-0"
Limit of excavation ⟨3⟩
Assumed maximum foundation elevation
Assumed rock surface

SECTION B-B



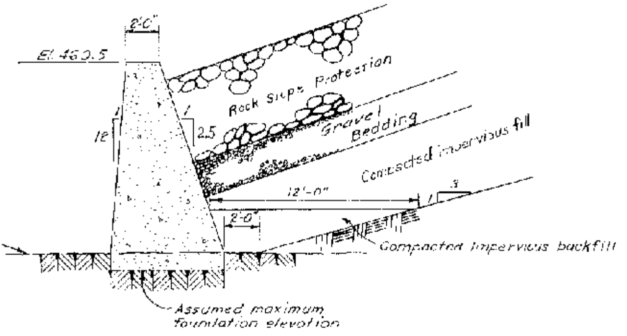
KEY PLAN



ELEVATION

EAST RETAINING WALL

SCALE 1/4" = 1'-0"


2'-0"
El. 460.5
Rock Slope Protection
1
12
1
2.5
Gravel Bedding
Compacted impervious fill
12'-0"
3
1
2'-0"
Compacted impervious backfill
Assumed maximum foundation elevation

SECTION C-C

NOTES:

Elevations refer to Mean Sea Level Datum.
For details of structural jts. see Sheet No. 34.
Concrete in Retaining Walls will be paid for under Item No. 55.
All joints shown on this sheet to be flush.
Figures in hexagons indicate item numbers under which payment will be made.

GRAPHIC SCALE

1/4" = 1'-0" 4' 0 4' 8'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.J.B. DR. BY K.H.W. CK. BY R.R.

PROJECT ENGINEER J. Hastler

APPROVAL RECOMMENDED
C. Bagwell
CHIEF, BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
RETAINING WALLS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

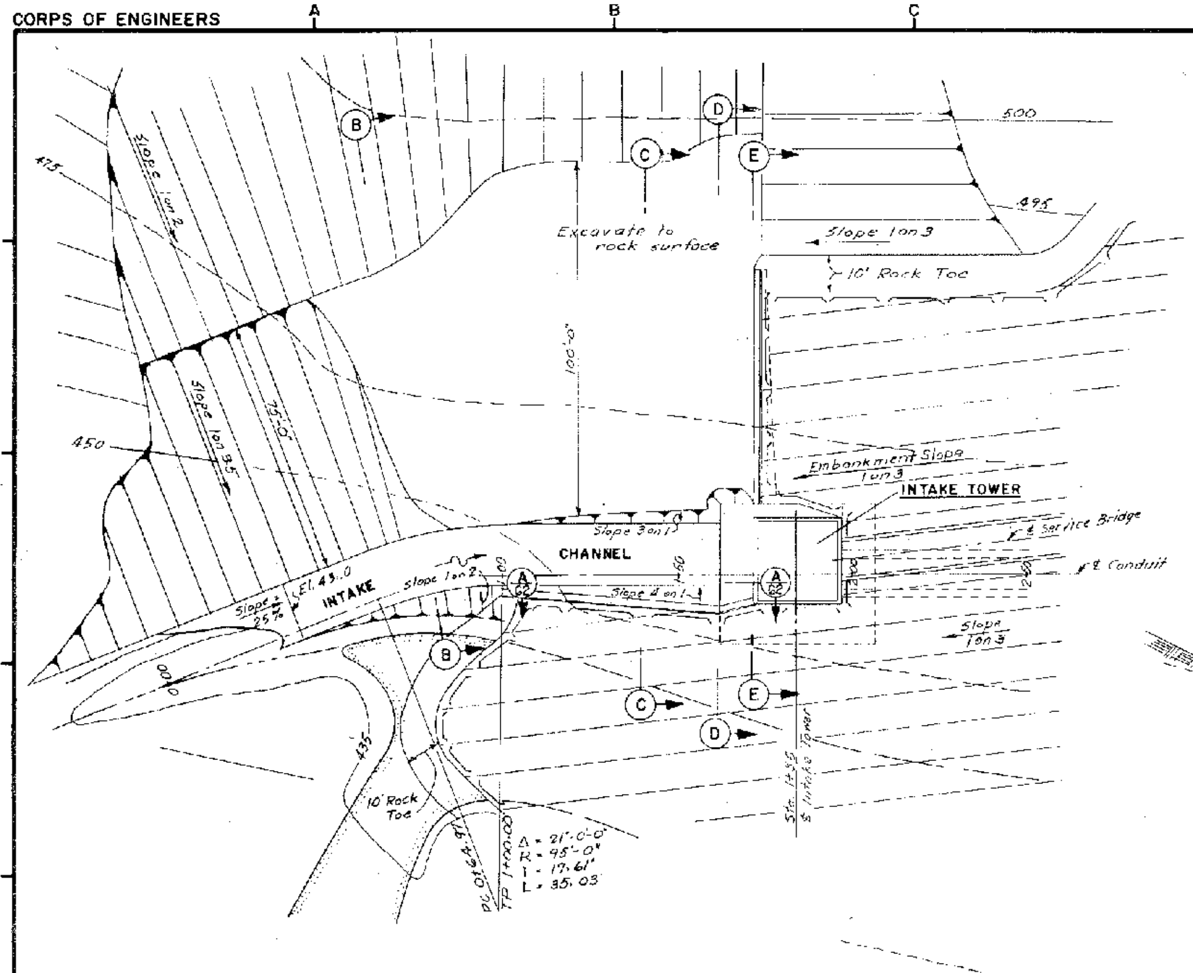
APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

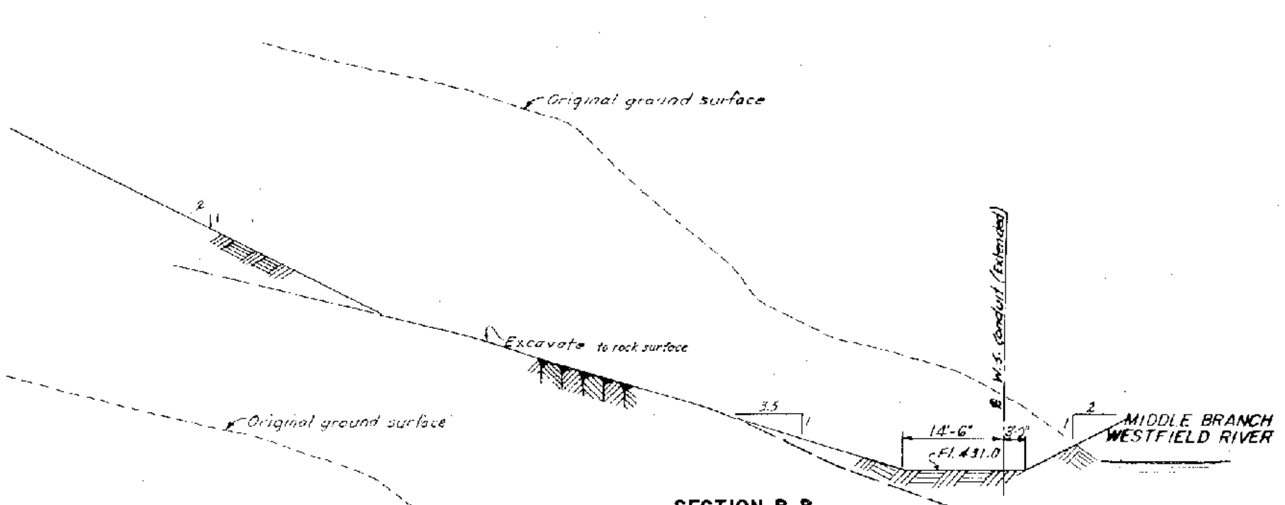
SCALE: 1/4" = 1'-0" SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5768

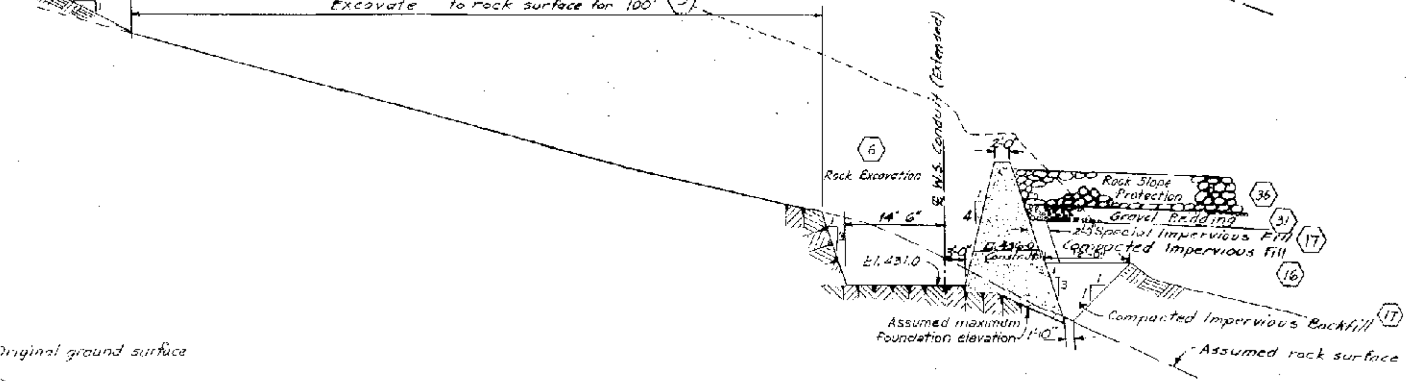
SHEET 62



PLAN
SCALE: 1"=20'

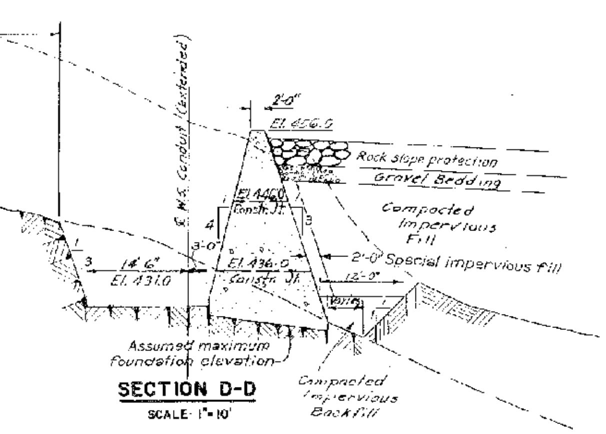


SECTION B-B
SCALE: 1"=10'

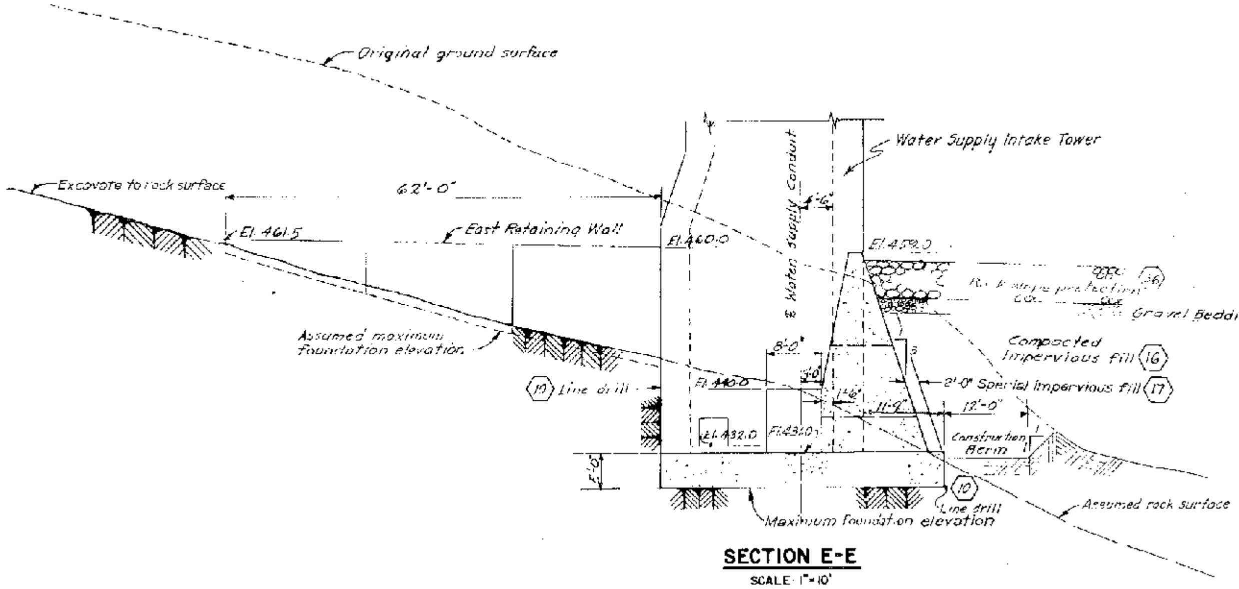


Original ground surface
Excavate to rock surface for 100' ③
⑥ Rock Excavation
℄ W.S. Conduit (Extended)
14'-6"
El. 431.0
3'-0"
4
Rock Slope Protection ㊱
Gravel Bedding ㉛
2'-0" Special Impervious Fill ⑰
Compacted Impervious Fill ⑯
Compacted Impervious Backfill ⑰
Assumed maximum foundation elevation
Assumed rock surface

SECTION C-C
SCALE: 1"=10'



SECTION D-D
SCALE: 1"=10'



SECTION E-E
SCALE: 1"=10'

NOTES
All elevations refer to Mean Sea Level Datum.
Figures in hexagons indicate item numbers under which payment will be made.
For general notes see Sheet No. 60
Concrete retaining walls will be paid for under Item No. 55.
For details of structural joints see Sheet No. 34.
All joints shown on this sheet to be flush

GRAPHIC SCALES
1"=20' 20' 0 20' 40'
1"=10' 10' 0 10' 20'

REVISION	DATE	DESCRIPTION

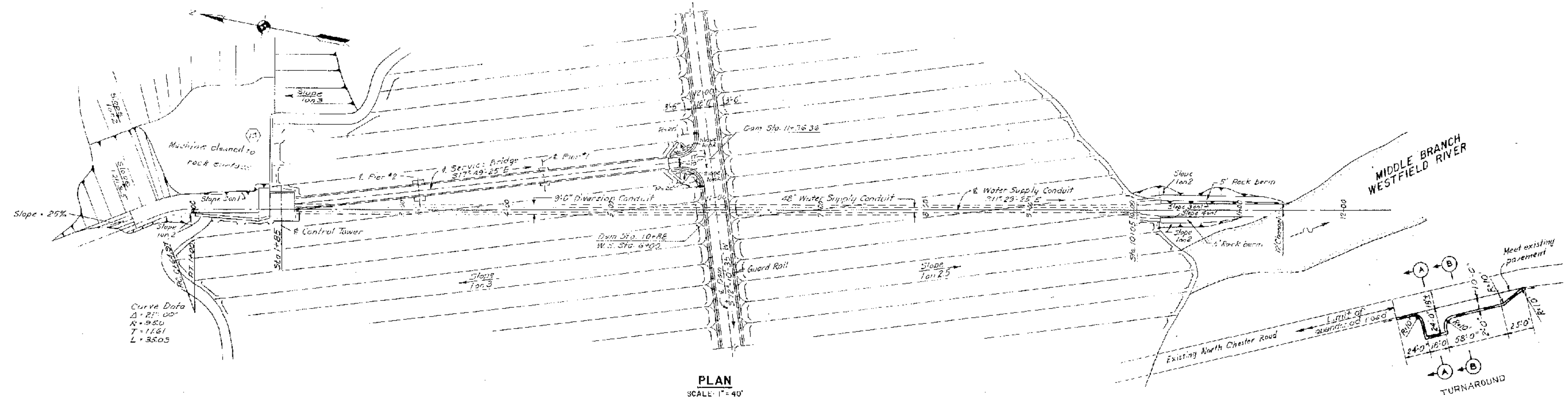
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY K.S.B. DR. BY K.H.W. CK. BY P.H.

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
PLAN AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

PROJECT ENGINEER
APPROVAL RECOMMENDED CHIEF, [illegible] BRANCH
APPROVED CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5767
SHEET 61



PLAN
SCALE: 1" = 40'

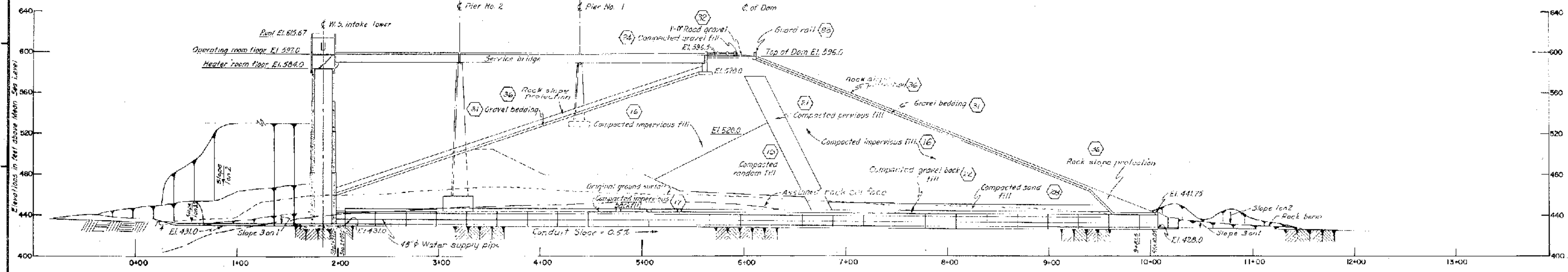
NOTES

All elevations refer to Mean Sea Level Datum.

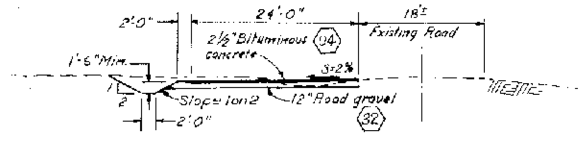
Figures in hexagons indicate item numbers under which payment will be made.

For embankment Sections see Sheet No. 25

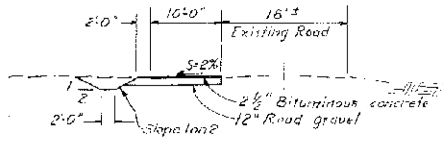
For Service Bridge Plan & Details see Sheet Nos. 91 to 93



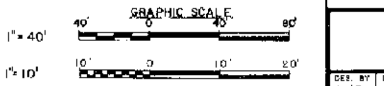
PROFILE ALONG ℄ CONDUIT
SCALE: 1" = 40'



SECTION A-A
SCALE 1"=10'-0"



SECTION B-B
SCALE 1"=10'-0"



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.J.B. DR. BY K.H.W. CK. BY P.H.

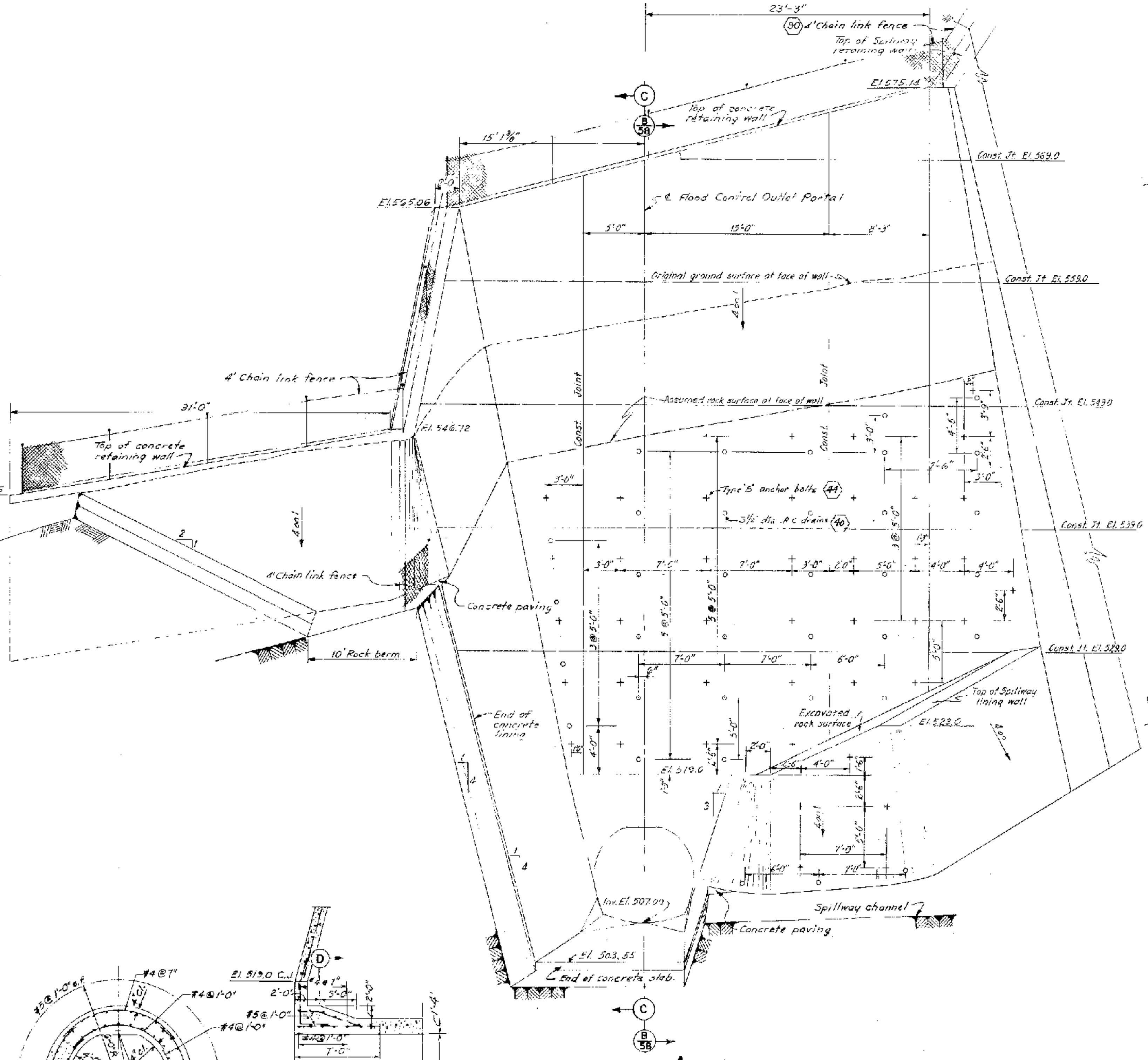
PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, P. & P. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY & SERVICE BRIDGE
PLAN AND PROFILE
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

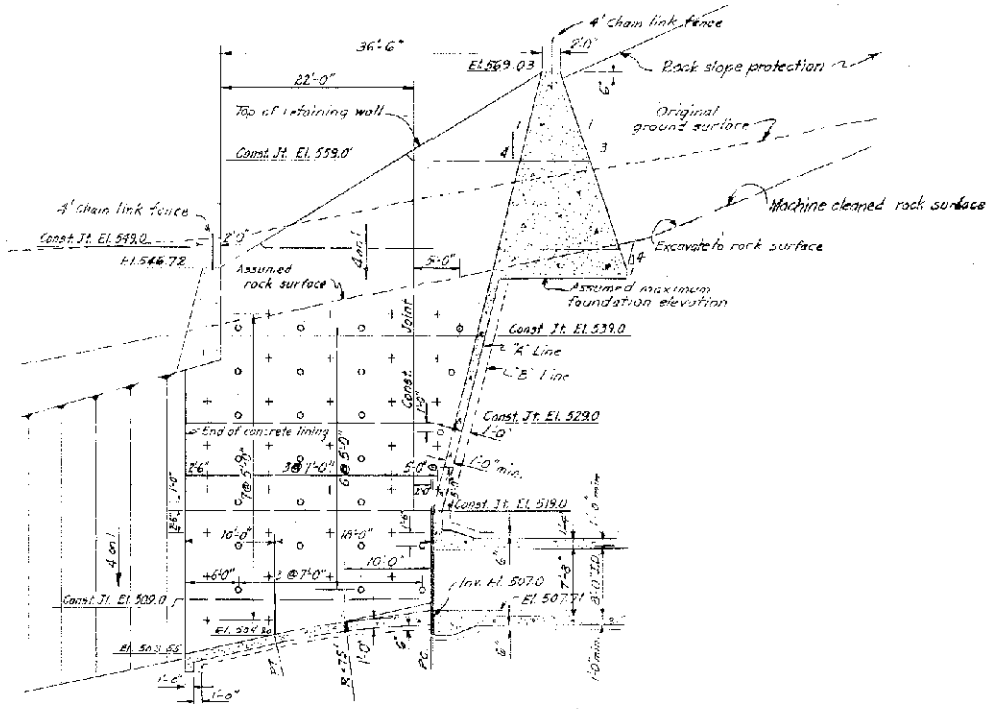
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: 1" = 40'
SPEC. NO. CIV. ENG. 19-016-62-45
DRAWING NUMBER
CT-1-5766
SHEET 60



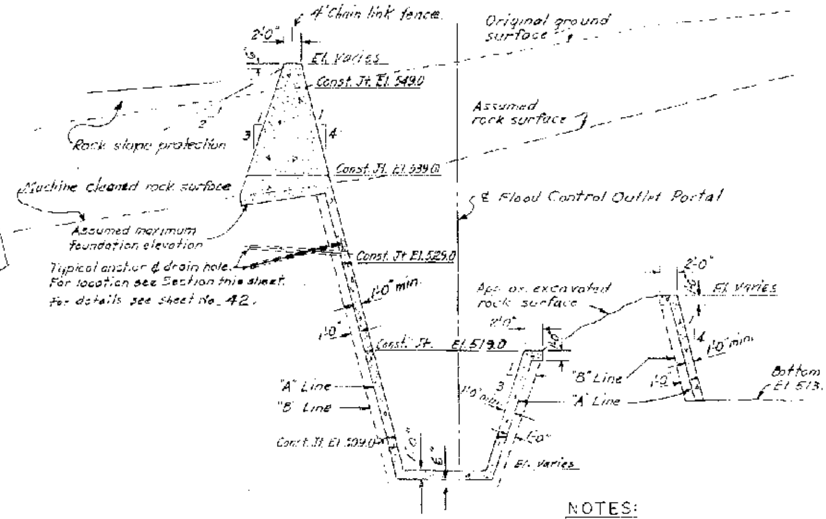
SECTION $\frac{A}{58}$

SCALE: 1/4" = 1'-0"



SECTION C-C & $\frac{C}{58}$

SCALE: 1/8" = 1'-0"


4' Chain link fence
Original ground surface
El. Varies
Const. Jt. El. 549.0
Assumed rock surface
Rock slope protection
Const. Jt. El. 539.0
Machine cleaned rock surface
℄ Flood Control Outlet Portal
Assumed maximum foundation elevation
Typical anchor & drain hole. For location see Section this sheet. For details see sheet No. 42.
Const. Jt. El. 529.0
1'-0" min.
Apr. or excavated rock surface
El. Varies
Const. Jt. El. 519.0
"B" Line
"A" Line
Bottom of Spillway chute, El. 513.34
Const. Jt. El. 509.0
El. Varies

SECTION $\frac{F}{58}$

SCALE: 1/8" = 1'-0"

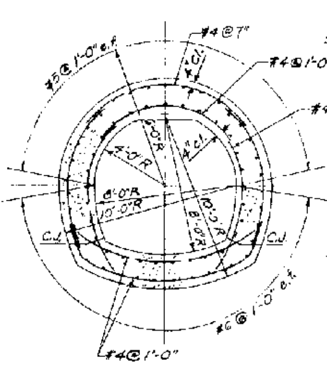
NOTES:

For general notes applying to this sheet, see Sheet No. 58.

Figures in hexagons indicate Item Nos. under which payment will be made.

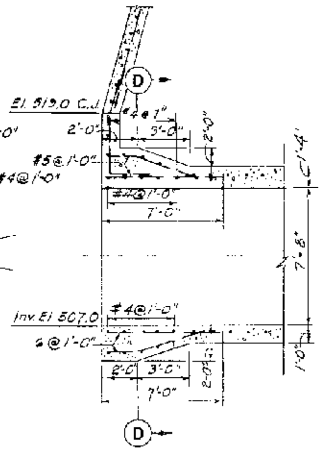
All concrete lining to be reinforced with #6 bars, 1'-0" O.C. both ways. For detail see Sheet No. 34.

For General Notes applying to steel reinforcement see Sheet No. 49.



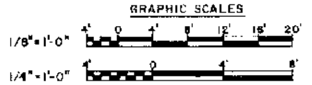
SECTION D-D

SCALE: 1/4" = 1'-0"



SECTION AT OUTLET

SCALE: 1/4" = 1'-0"



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B.	K.H.W.	P.A.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, Q & R BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL OUTLET PORTAL
SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

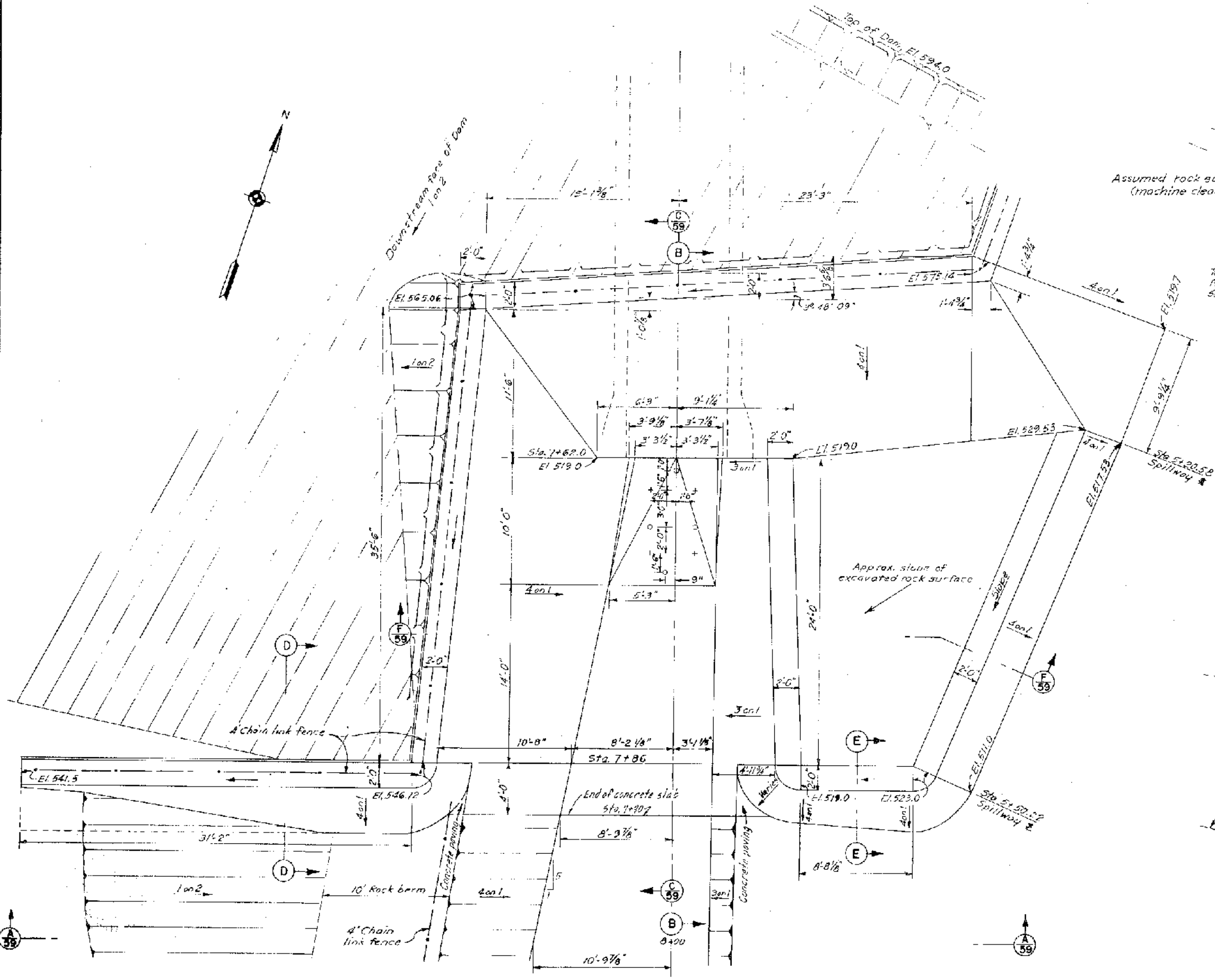
APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

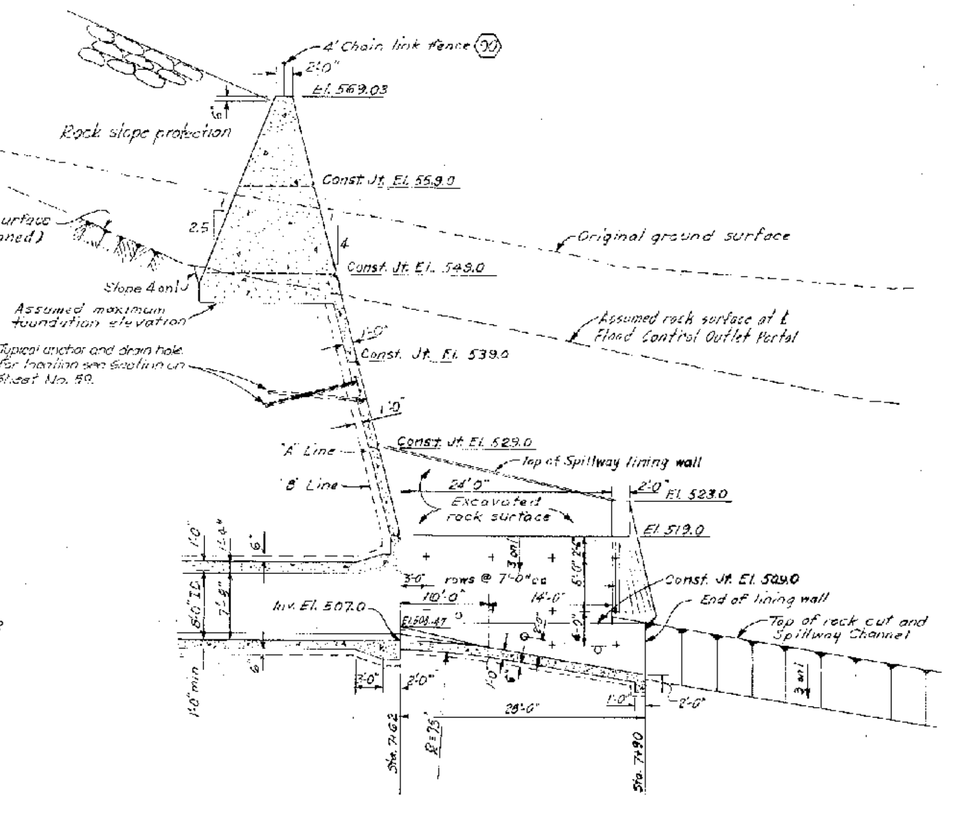
SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-45

DRAWING NUMBER
CT-1-5765

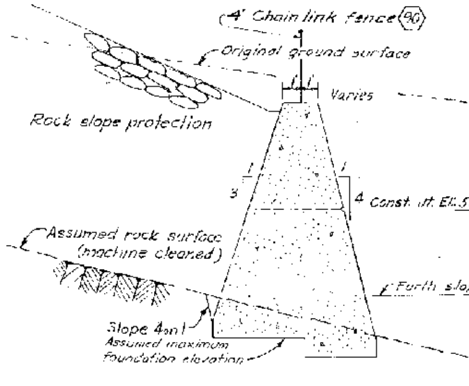
SHEET 59



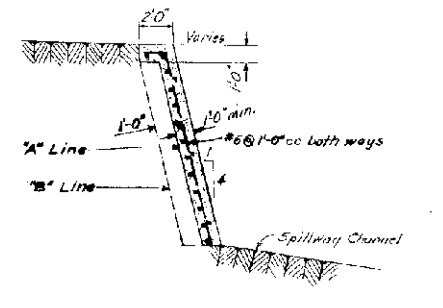
PLAN
SCALE 1/4" = 1'-0"



SECTION B-B
SCALE 1/8" = 1'-0"



SECTION D-D
SCALE 1/4" = 1'-0"



SECTION E-E
SCALE 1/4" = 1'-0"

NOTES

Elevations refer to mean sea level datum.

For details of type "B" anchors see Sheet No. 34 and 42

For details of drains see Sheet No. 42.

For details of structural joints see Sheet No. 34.

Line "A" indicates minimum thickness of concrete.

Line "B" indicates payment line for rock excavation and concrete.

Concrete in tunnel lining to be paid for under Item No. 50.

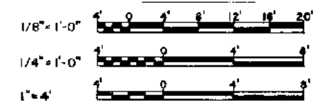
Concrete in outlet portal retaining walls will be paid for under Item No. 45.

Concrete in lining will be paid for under Item No. 46.

Payment for furnishing, bending and placing of all steel reinforcement will be made under Item No. 64.

Figures in hexagons indicate item number under which payment will be made.

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.J.B. DR. BY K.H.W. CK. BY

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL OUTLET PORTAL
PLAN AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

PROJECT ENGINEER

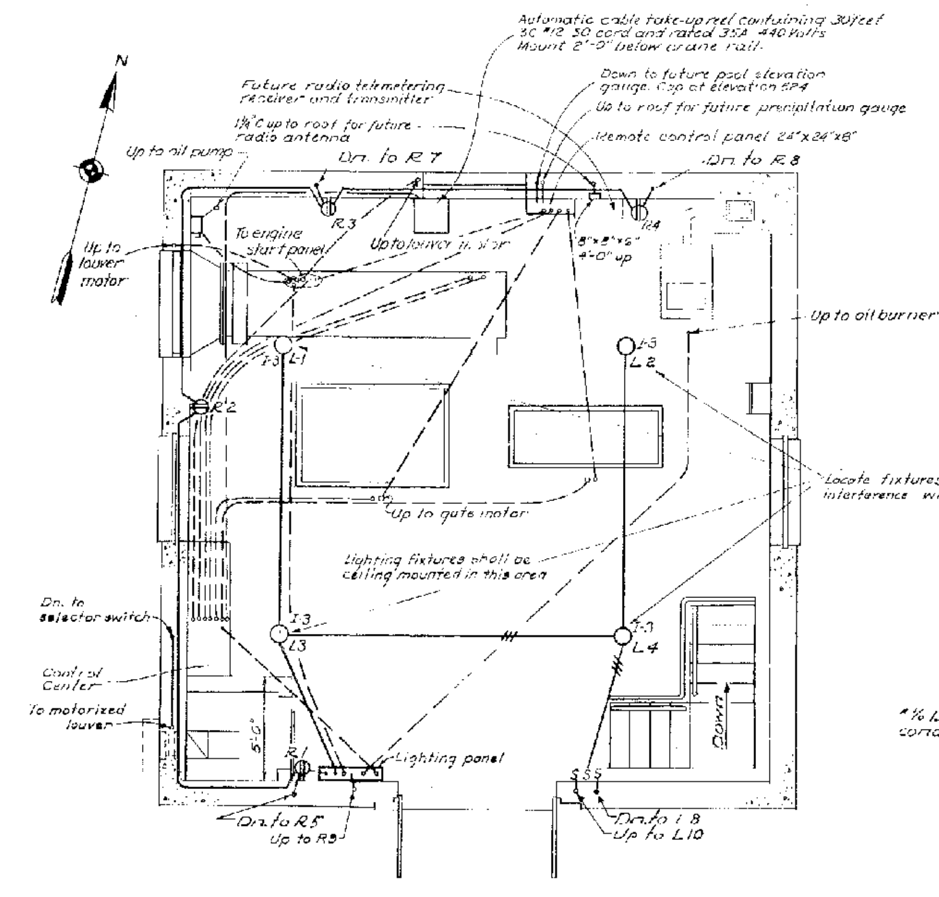
APPROVAL RECOMMENDED
CHIEF, F. & M. BRANCH

APPROVED
CHIEF, ENGINEERING DIVISION

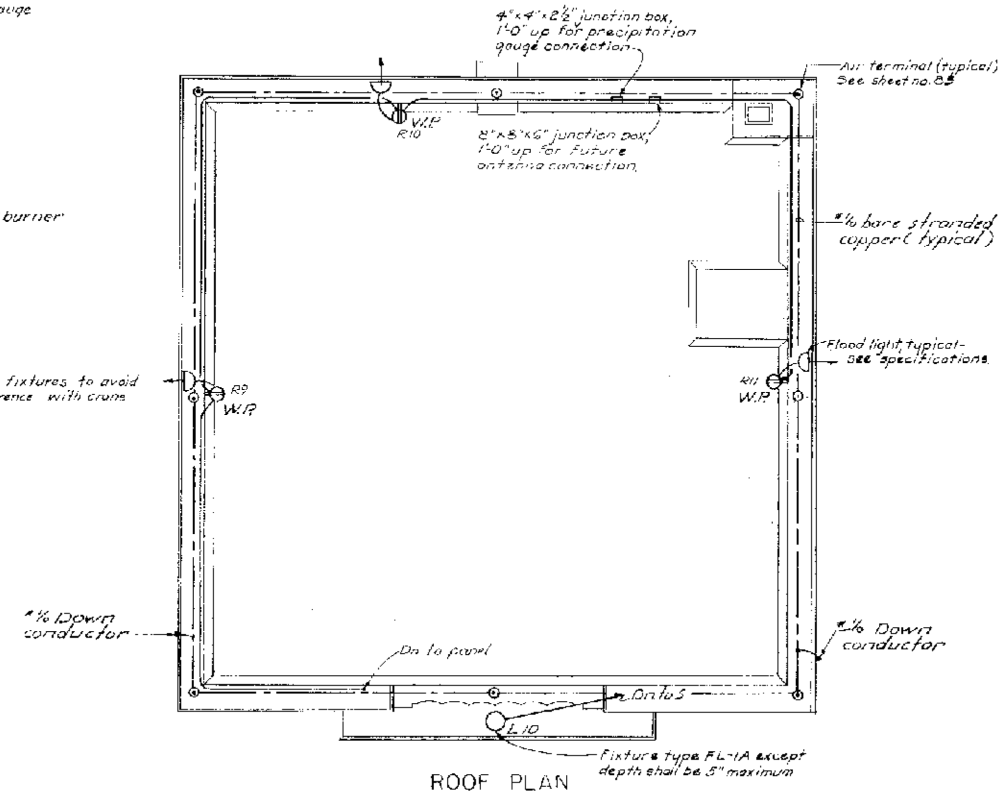
DATE MARCH 1962

SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-45
DRAWING NUMBER
CT-1-5764
SHEET 58

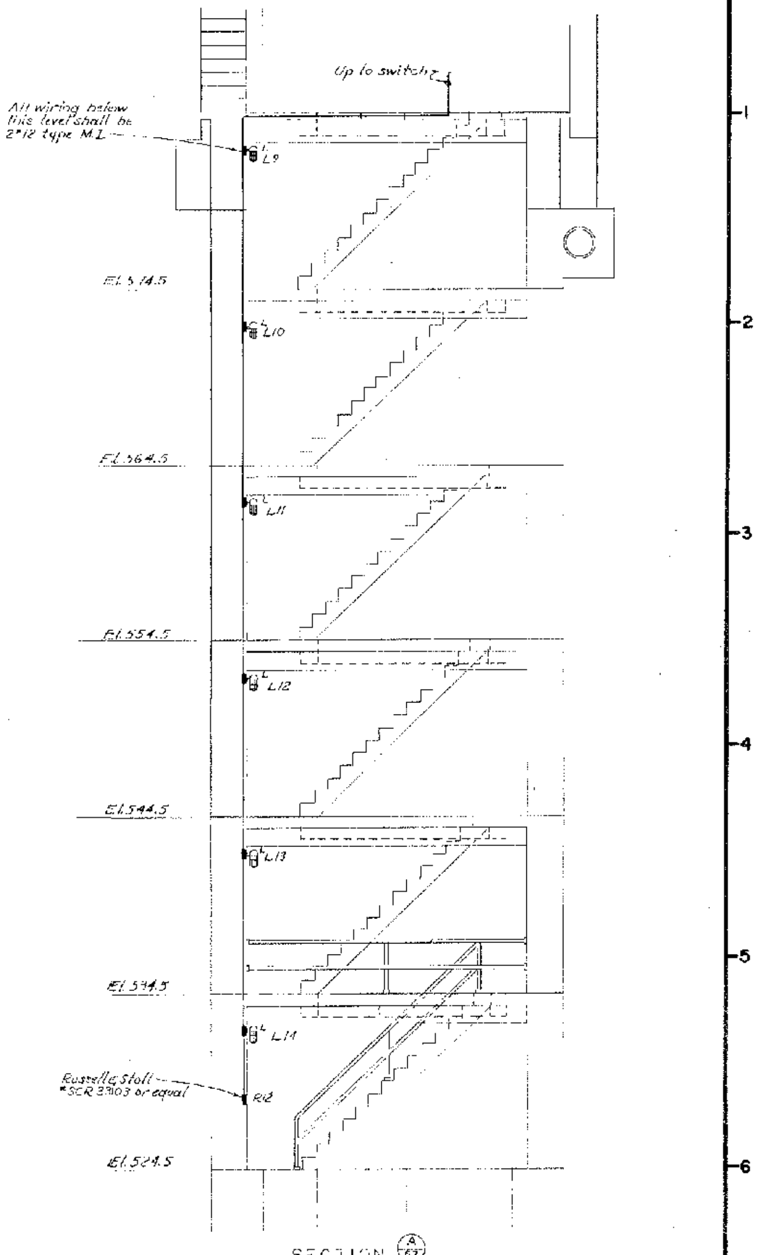
CORPS OF ENGINEERS U. S. ARMY


N
Automatic cable take-up reel containing 30 feet 3C #12 SO cord and rated 35A 440 Volts Mount 2'-0" below crane rail.
Future radio telemetering receiver and transmitter
Down to future pool elevation gauge. Cap at elevation 584
Up to roof for future precipitation gauge
1¼"C up to roof for future radio antenna
Remote control panel 24"x24"x8"
Up to oil pump
Dn. to R7
Dn. to R8
R3
R4
To engine start panel
Up to louver motor
8"x8"x6" 4'-0" up
Up to louver motor
Up to oil burner
L1
L2
R2
Up to gate motor
Locate fixtures to avoid interference with crane
Lighting fixtures shall be ceiling mounted in this area
Dn. to selector switch
L3
L4
Control Center
To motorized louver
5'-6"
R1
Lighting panel
Down
Dn. to R5
Up to R9
Dn. to L8
Up to L10

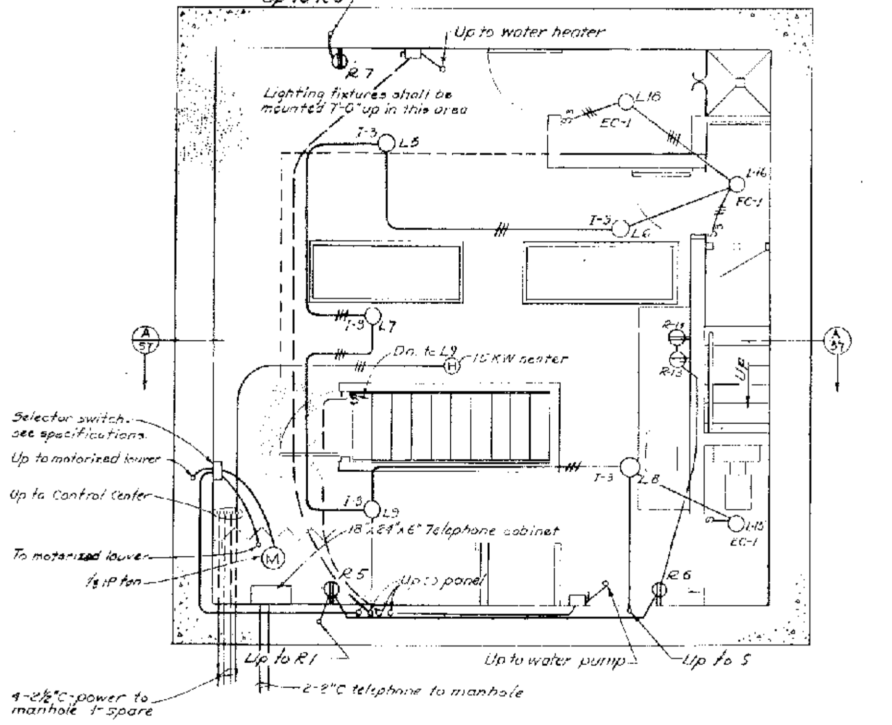
PLAN - OPERATING ROOM
SCALE 3/8"=1'-0"


4"x4"x2½" junction box, 1'-0" up for precipitation gauge connection
Air terminal (typical) See sheet no. 85
8"x8"x6" junction box, 1'-0" up for future antenna connection.
W.P. R10
#⅛ bare stranded copper (typical)
Flood light, typical - see specifications.
R9 W.P.
R11 W.P.
#⅛ Down conductor
#⅛ Down conductor
Dn. to panel
Dn. to S
L10
Fixture type FL-1A except depth shall be 5" maximum

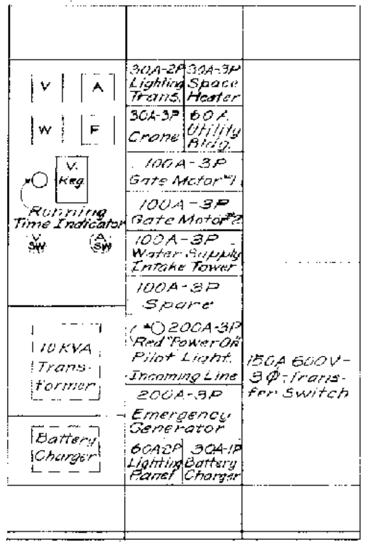
ROOF PLAN
SCALE 3/8"=1'-0"



SECTION (A/57)
SCALE 1/4" = 1'-0"



PLAN - BASEMENT ROOM
SCALE 3/8"=1'-0"



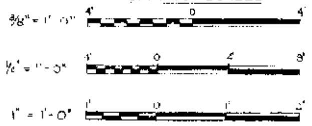
CONTROL CENTER
FRONT VIEW
SCALE 1" = 1'-0"

NOTES-
All receptacles and wall switches shall be mounted 4'-0" above the floor.
For symbols see Drawing No. 40-06-04, sheet 1 in the specifications.

LIGHTING PANEL				
120/240V., S/N, 3-WIRE 1 Φ, 100A. MAINS - LUGS ONLY				
CIR. NO.	BRANCH FUSE AMP. SIZE	NO. POLES	SERVES	CONN. LOAD WATTS
1	20	1	Lights - Operating room	800
2			Lights - Shelter room	1200
3			Lights - stairwell	900
4			Floodlights	1500
5			Receptacles R1, R5, R6, R13, R14	500
6			Receptacles R2, R3, R4, R7, R8	500
7			Water heater	1600
8			Waterpump	500
9			Oil pump & louvers	500
10			Oil burner	500
11			Fan	350
12			Spare	—
			TOTAL	8350

NOTES-
All receptacles and wall switches shall be mounted 4'-0" above the floor.
For symbols see Drawing No. 40-06-04, Sheet No. 1 in the specifications.
Electrical work in the flood control gate shaft will be paid for under Item 82.

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

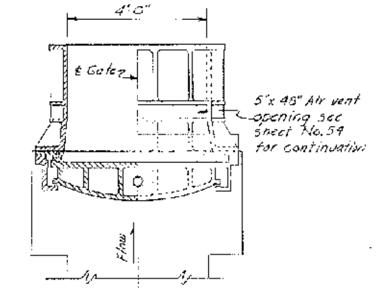
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY W.A.P. DR. BY J.G.M. R.S.P. CK. BY
SUBMITTED — CHIEF, ELECT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED — CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED — CHIEF, BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
ELECTRICAL
PLANS AND SECTION
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED — CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

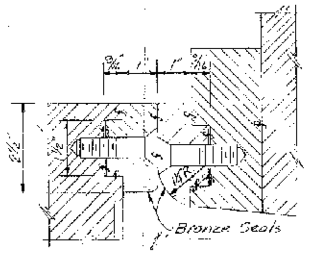
SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5763
SHEET 57



PLAN

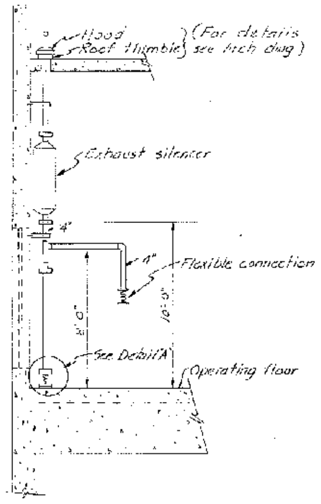
SECTION (C/55) . SECTION (D/55)

SCALE 1/2" = 1'-0"



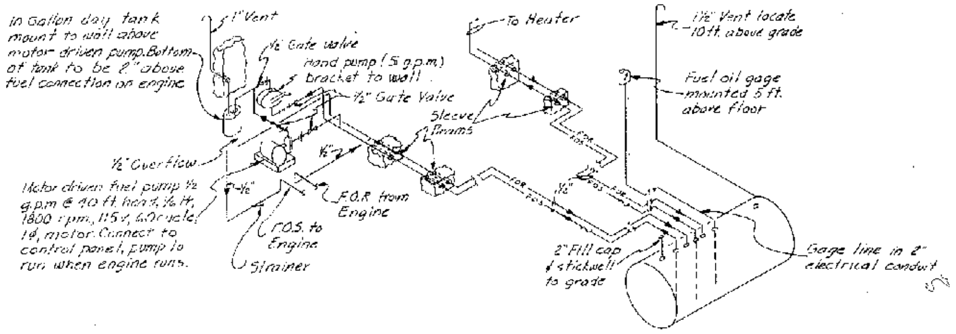
DETAIL "B"

SCALE : 1/2" = 1"



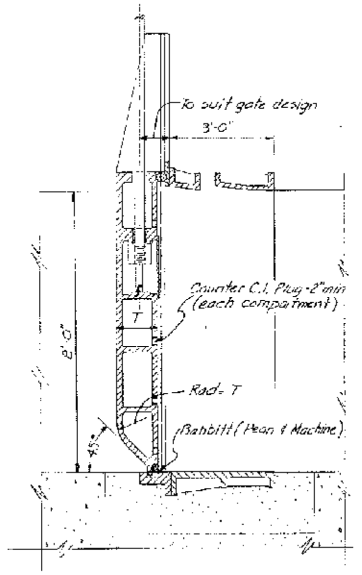
DETAIL OF ENGINE EXHAUST PIPING

SCALE 1/4" = 1'-0"


10 Gallon day tank mount to wall above motor driven pump. Bottom of tank to be 2" above fuel connection on engine
1" Vent
½" Gate valve
Hand pump (5 g.p.m) bracket to wall
½" Gate Valve
To Heater
1½" Vent locate 10 ft. above grade
Fuel oil gage mounted 5 ft. above floor
Sleeve Drains
½" Overflow
½"
Motor driven fuel pump ½ g.p.m @ 40 ft. head, ¼ H, 1800 r.p.m., 115v, 60 cycle, 1φ, motor. Connect to control panel, pump to run when engine runs.
F.O.R. from Engine
F.O.S. to Engine
Strainer
F.O.R.
F.O.S.
½"
2" Fill cap & stickwell to grade
Gage line in 2" electrical conduit

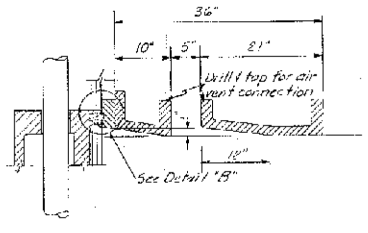
FUEL PIPING DIAGRAM

NOT TO SCALE



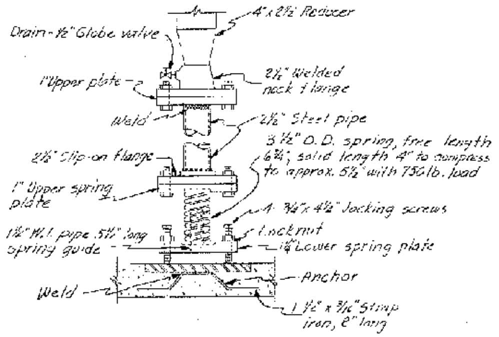
SECTION THRU GATE

SCALE 1/2" = 1'-0"



DETAIL - CONDUIT LINER

SCALE 1" = 1'-0"


4" x 2½" Reducer
Drain - ½" Globe valve
1" Upper plate
2½" Welded neck flange
Weld
2½" Steel pipe
3½" O.D. spring, free length 6¾", solid length 4" to compress to approx. 5½" with 750 lb. load
2½" Slip-on flange
1" Upper spring plate
4 - ¾" x 4½" Jacking screws
Locknut
1½" W.I. pipe 5½" long spring guide
1" Lower spring plate
Anchor
Weld
1½" x 3/16" Strap iron, 8" long

DETAIL "A"

NOT TO SCALE

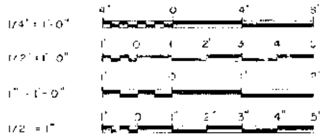
NOTES:

All work, materials, and equipment in connection with the Gates and Accessories, as specified, will be paid for under Item No. 79.
All work, materials and equipment in connection with the Diesel Electric Generating Set, as specified, will be paid for under Item No. 81.

GATE ASSEMBLY DETAILS

SCALE: AS SHOWN

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.T.S. F.J.G. | DR. BY R.P.C. | CK. BY

SUBMITTED
CHIEF, MECH. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
MECHANICAL
GATE ASSEMBLY AND MISC. DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 962

SCALE

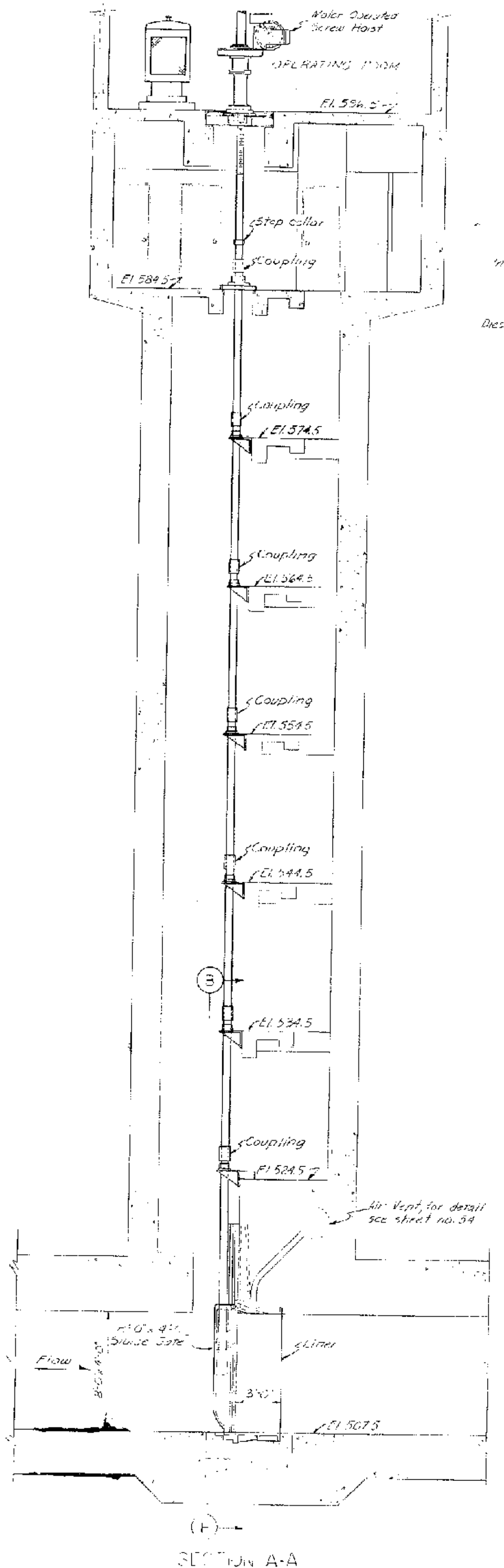
SPEC. NO. [illegible]

DRAWING NUMBER
CT-1-5762

SHEET 56

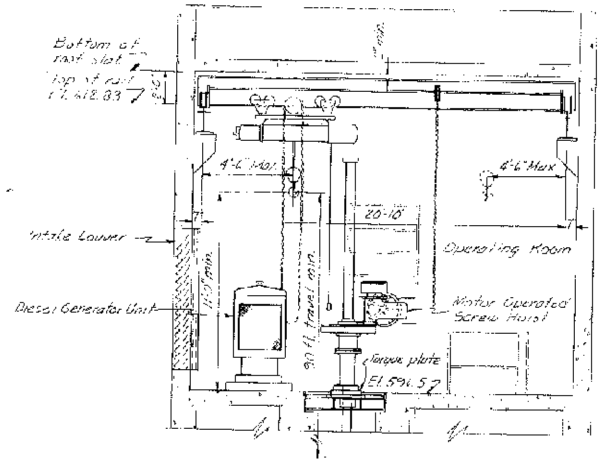
CORPS OF ENGINEERS

U. S. ARMY



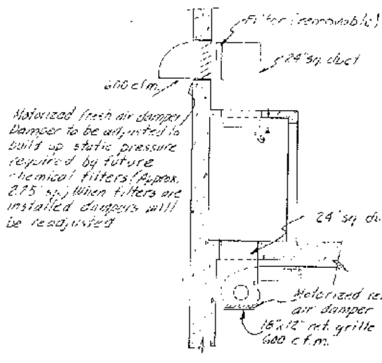
SECTION A-A

SCALE 1/4" = 1'-0"



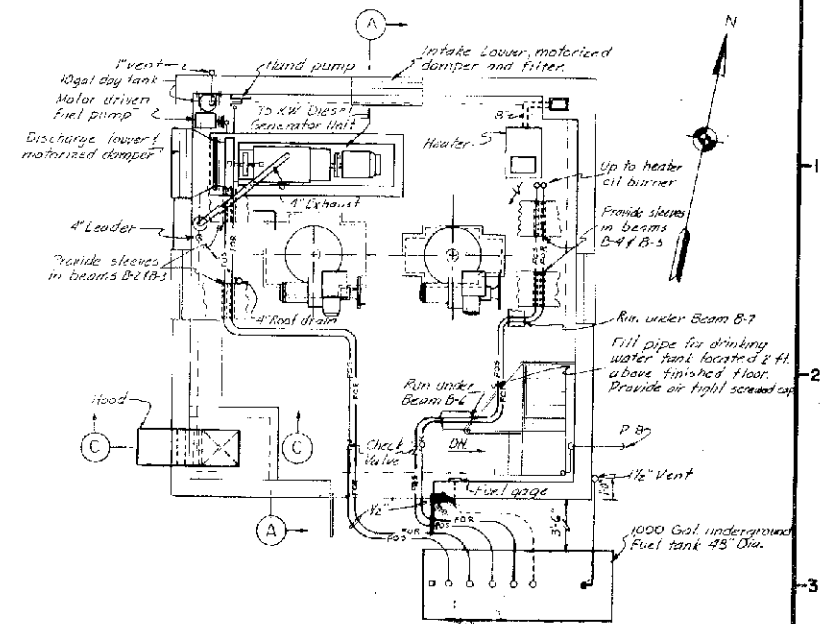
SECTION A-A-CONT.

SCALE 1/4" = 1'-0"


Filter (removable)
24" sq. duct
600 cfm
Motorized fresh air damper. Damper to be adjusted to build up static pressure required by future chemical filters (Approx. 275 sq.) When filters are installed dampers will be readjusted
24" sq. duct
Motorized return air damper
18"x12" ret. grille 600 c.f.m.

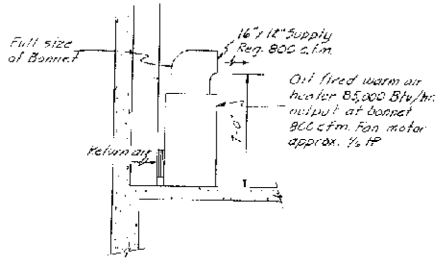
SECTION C-C

SCALE 1/4" = 1'-0"


A
N
1" vent
10 gal day tank
Motor driven fuel pump
Hand pump
Intake Louver, motorized damper and filter.
75 KW Diesel Generator Unit
Discharge louver & motorized damper
Heater S
Up to heater oil burner
Provide sleeves in beams B-4 & B-5
4" Exhaust
4" Leader
Provide sleeves in beams B-2 & B-3
4" Roof drain
Run under Beam B-7
Fill pipe for drinking water tank located 2 ft. above finished floor. Provide air tight screwed cap
Run under Beam B-6
Hood
C
C
Check Valve
DN
P 8
1 1/2" Vent
Fuel gage
1/2"
FOS
FOR
3'-6"
1000 Gal. underground Fuel tank 48" Dia.
A

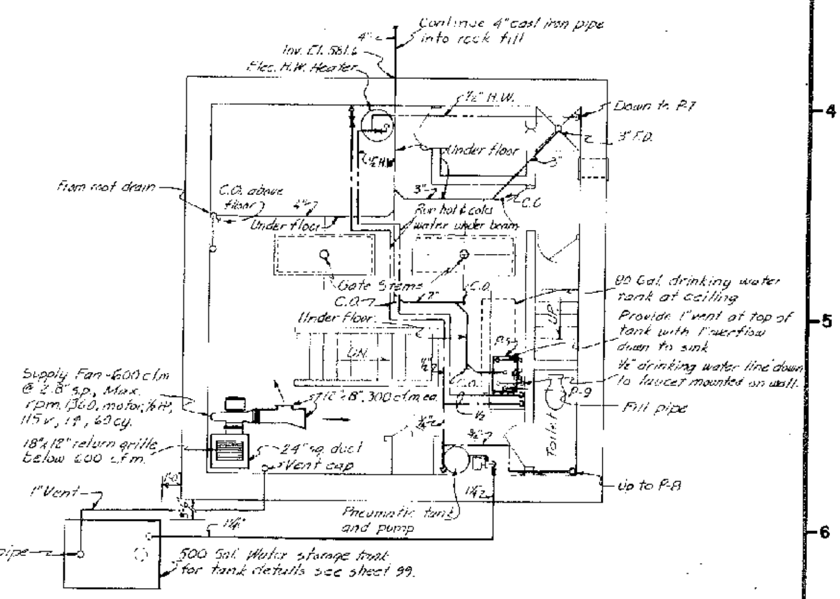
OPERATING ROOM FLOOR PLAN

SCALE 1/4" = 1'-0"


Full size of Bonnet
16"x 12" Supply Reg. 800 c.f.m.
Oil fired warm air heater 85,000 Btu/hr. output at bonnet 800 cfm. Fan motor approx. 1/2 HP
Return air
7'-0"

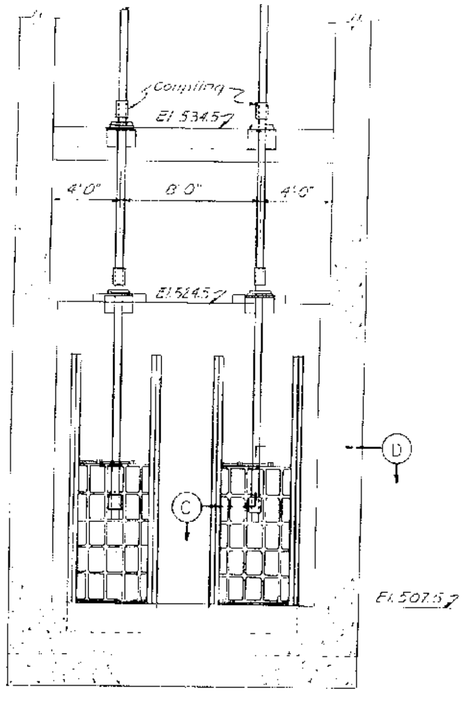
WARM AIR HEATER DETAIL

SCALE 1/4" = 1'-0"


Continue 4" cast iron pipe into rock fill
4"
Inv. El. 581.6
Elec. H.W. Heater
1/2" H.W.
Down to P-7
3" F.D.
Under floor
From roof drain
C.O. above floor
4"
Under floor
3"
C.O.
Run hot & cold water under beam
Gate Stems
C.O.
C.O.
2"
Under Floor
DN
UP
80 Gal. drinking water tank at ceiling
Provide 1" vent at top of tank with 1" overflow down to sink
1/2" drinking water line down to faucet mounted on wall.
P-9
Fill pipe
Toilet
Supply Fan-600 cfm @ 2.8" s.p., Max. rpm 1360, motor 1/6 HP, 115 v., 1 ph, 60 cy.
12" x 8", 300 cfm ea.
18"x12" return grille below 600 c.f.m.
24" sq. duct
Vent cap
1" Vent
1 1/4"
1 1/2"
Pneumatic tank and pump
Up to P-8
2" Fill pipe
500 Gal. Water storage tank for tank details see sheet 99.

BASEMENT FLOOR PLAN

SCALE 1/4" = 1'-0"



SECTION B-B

SCALE 1/4" = 1'-0"

NOTES:

All work, materials and equipment in connection with the Heating and Ventilating System, as specified, will be paid for under Item No. 78.

All work, materials and equipment in connection with the Gates and Accessories, as specified, will be paid for under Item No. 79.

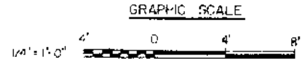
All work, materials and equipment in connection with the Traveling Crane, as specified, will be paid for under Item No. 80.

All work, materials and equipment in connection with the Diesel Electric Generating Set, as specified, will be paid for under Item No. 81.

All work, materials and equipment in connection with the Plumbing System, as specified, will be paid for under Item No. 68.

All work, materials and equipment in connection with the 500 Gallon Water Storage Tank, as specified will be paid for under Item No. 100.

GRAPHIC SCALE



REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.T.S. | DR. BY R.R.C. | CK. BY

SUBMITTED
CHIEF, MECH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
MECHANICAL
PLANS, SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

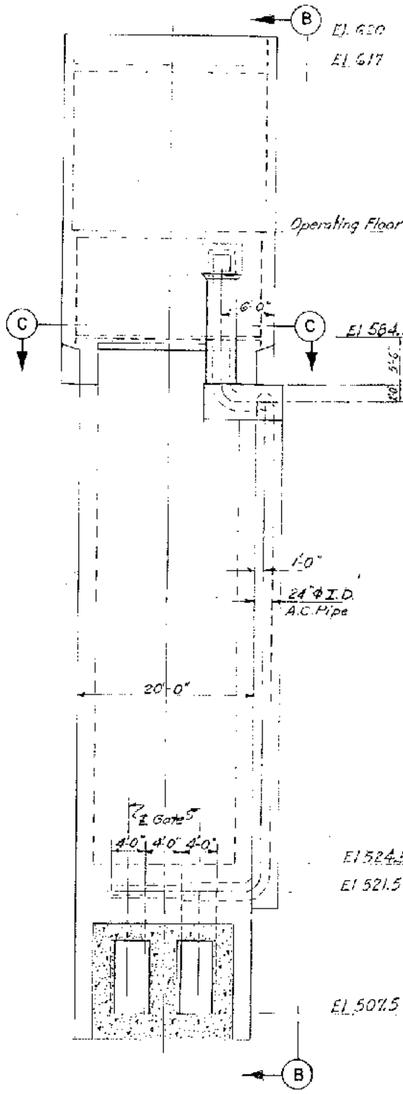
APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

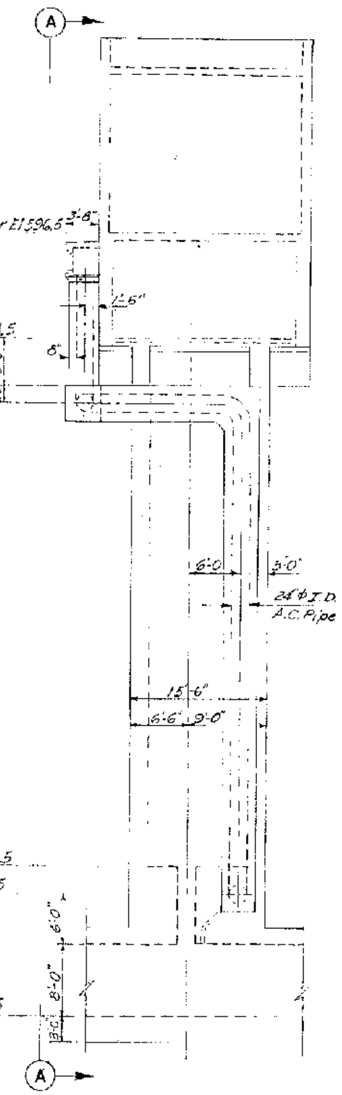
SCALE: AS SHOWN | SPEC. NO. CIV. ENG-19-016-6245

DRAWING NUMBER
CT-1-5761

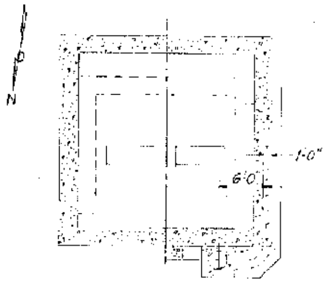
SHEET 55



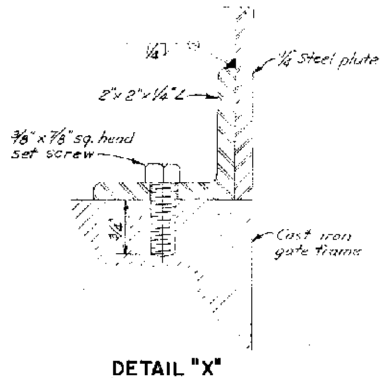
SECTION A-A
SCALE: 1/8" = 1'-0"



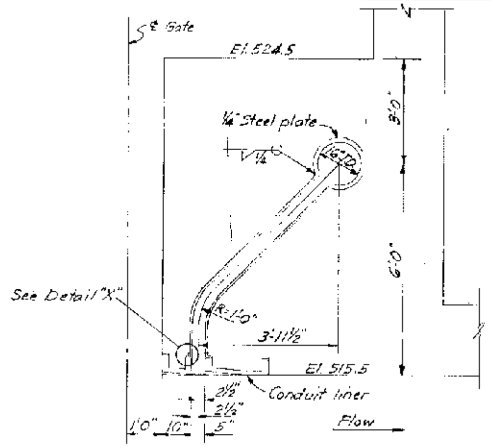
SECTION B-B
SCALE: 1/8" = 1'-0"



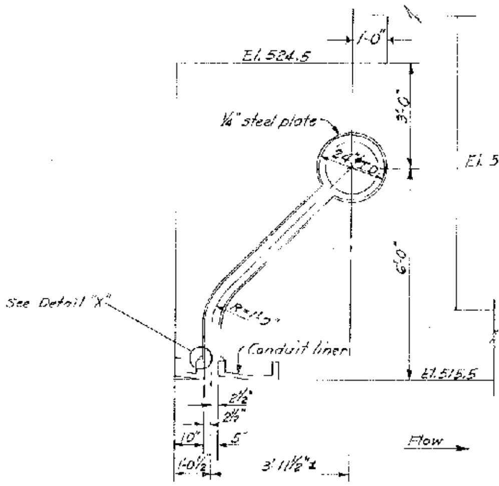
SECTION C-C
SCALE: 1/8" = 1'-0"



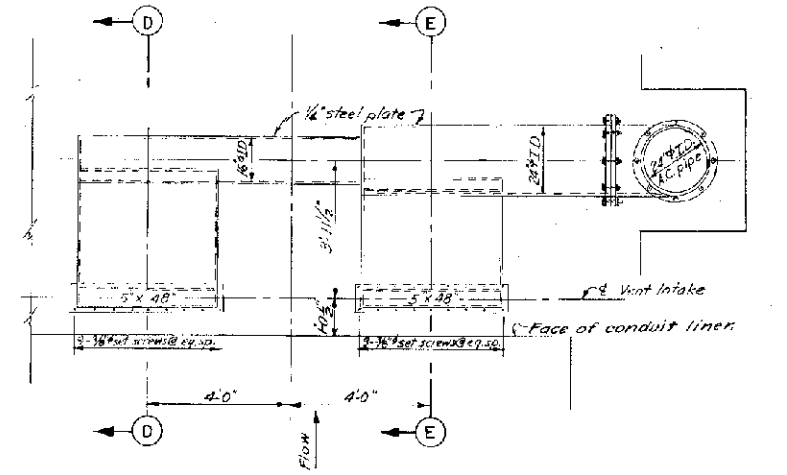
DETAIL "X"
FULL SIZE



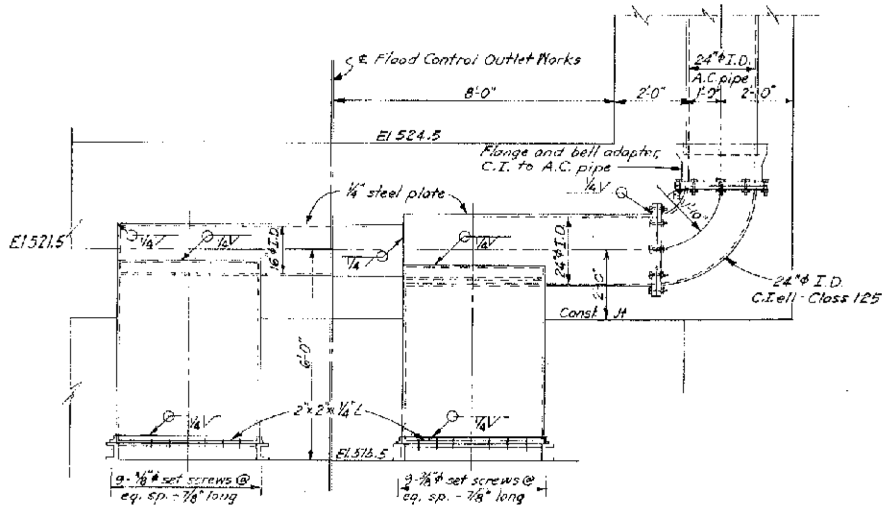
SECTION D-D
SCALE: 1/2" = 1'-0"



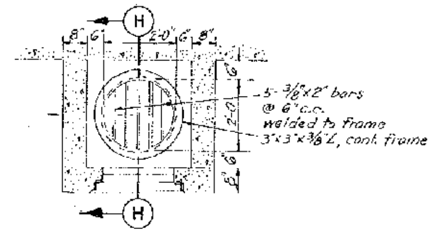
SECTION E-E
SCALE: 1/2" = 1'-0"



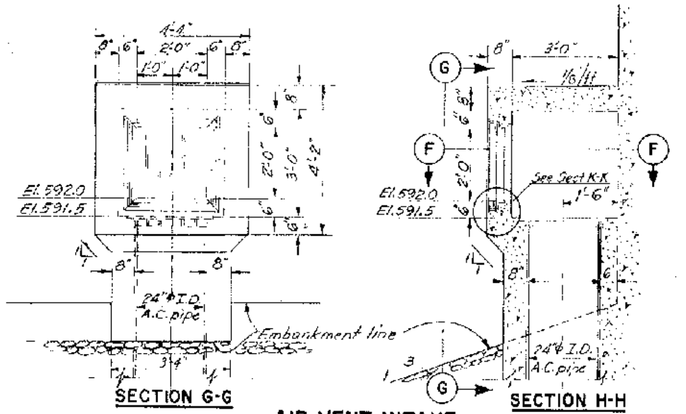
PLAN
SCALE: 1/2" = 1'-0"


℄ Flood Control Outlet Works
8'-0"
2'-0"
24"Φ I.D. A.C. pipe
1'-9"
2'-10"
El. 524.5
Flange and bell adapter C.I. to A.C. pipe
1/4 V
1/4" steel plate
El. 521.5
16"Φ I.D.
24"Φ I.D.
1/4 V
2'-0"
Const. Jt.
24"Φ I.D. C.I. ell - Class 125
6'-0"
1/4 V
2"×2"×1/4" ∠
1/4 V
El. 515.5
9-3/8"Φ set screws @ eq. sp. - 7/8" long
3-3/8"Φ set screws @ eq. sp. - 7/8" long

ELEVATION
SCALE: 1/2" = 1'-0"


H
8" 6" 2'-0" 6" 8"
5-3/8"×2" bars @ 6" c.c. welded to frame
3"×3"×3/8" ∠, cont. frame
6"
2'-0"
6"
8"
H

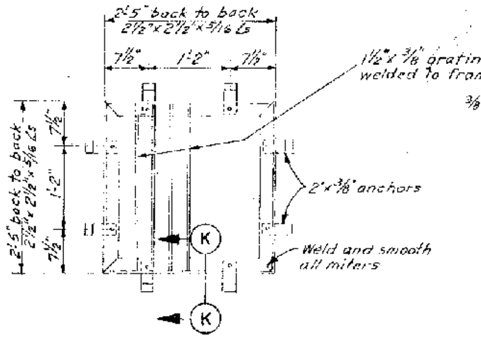
SECTION F-F



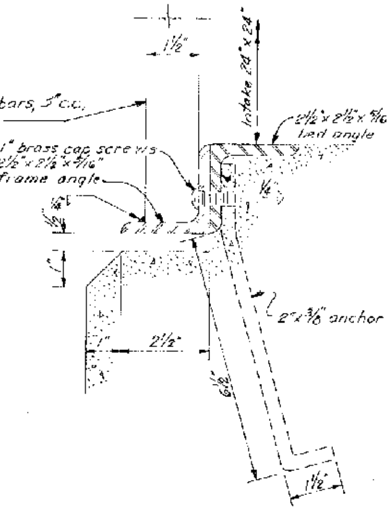
SECTION G-G

SECTION H-H

AIR VENT INTAKE
SCALE: 1/2" = 1'-0"



AIR VENT GRILL
SCALE: 1" = 1'-0"



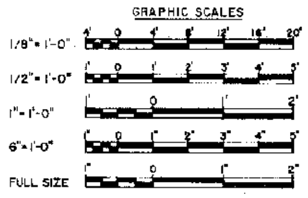
SECTION K-K
SCALE: 6" = 1'-0"

NOTES

Elevations refer to Mean Sea Level Datum

Air Vents and Accessories will be paid for under Item No. 71

For concrete reinforcement see Sheet No. 50



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
P.H.	K.H.W.	J.H.

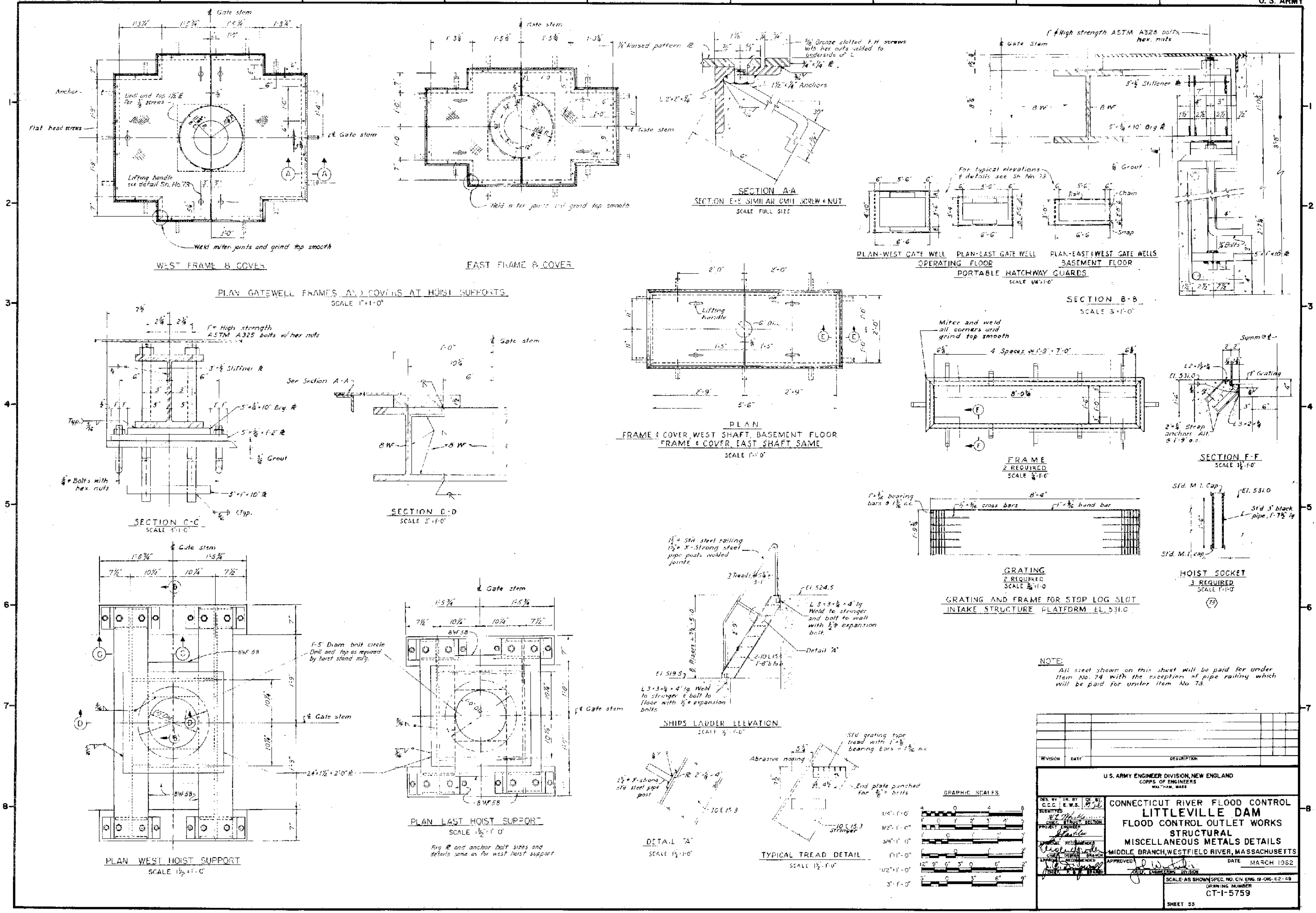
PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, ... BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
AIR VENTS AND ACCESSORIES
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5760
SHEET 54


CORPS OF ENGINEERS
U. S. ARMY
WEST FRAME & COVER
EAST FRAME & COVER
PLAN GATEWELL FRAMES AND COVERS AT HOIST SUPPORTS
SCALE 1"=1'-0"
Weld miter joints and grind top smooth
Lifting handle see detail Sh. No. 73
Flat head screws
Anchor
¼" Raised pattern ℙ
Gate stem
SECTION A-A
SECTION E-E SIMILAR OMIT SCREW & NUT
SCALE FULL SIZE
⅜" Bronze slotted F.H. screws with hex nuts welded to underside of L
1½" x ¼" Anchors
L 2"x2"x¼"
PLAN-WEST GATE WELL
PLAN-EAST GATE WELL
OPERATING FLOOR
PLAN-EAST & WEST GATE WELLS
BASEMENT FLOOR
PORTABLE HATCHWAY GUARDS
SCALE ¼"=1'-0"
For typical elevations & details see Sh No 73
Chain
Snap
Rail
SECTION B-B
SCALE 3"=1'-0"
1" ϕ High strength ASTM A325 bolts, hex. nuts
3"x½" Stiffener ℙ
5"x¾"x10" Brg ℙ
¾" Grout
¾" Bolts
5"x1"x10" ℙ
SECTION C-C
SCALE 1"=1'-0"
1" ϕ High strength ASTM A325 bolts w/ hex nuts
¾" ϕ Bolts with hex. nuts
SECTION D-D
SCALE 3"=1'-0"
See Section A-A
PLAN
FRAME & COVER, WEST SHAFT, BASEMENT FLOOR
FRAME & COVER, EAST SHAFT SAME
SCALE 1"=1'-0"
Lifting handle
6" Dia.
FRAME
2 REQUIRED
SCALE ¾"=1'-0"
Miter and weld all corners and grind top smooth
4 Spaces @ 1'-9" = 7'-0"
SECTION F-F
SCALE 1½"=1'-0"
Symm @ ℄
1" Grating
2x½" Strap anchors Alt. @ 1'-9" o.c.
El. 531.0
GRATING
2 REQUIRED
SCALE ¾"=1'-0
1"x3/16" bearing bars @ 1 3/16" o.c.
½"x3/16" cross bars
1"x3/16" band bar
GRATING AND FRAME FOR STOP LOG SLOT
INTAKE STRUCTURE PLATFORM EL. 531.0
HOIST SOCKET
3 REQUIRED
SCALE 1"=1'-0
Std. M.I. Cap
Std 3" black pipe, 1'-7½" lg
73
PLAN WEST HOIST SUPPORT
SCALE 1½"=1'-0"
1'-5" Diam. bolt circle Drill and tap as required by hoist stand mfg.
8WF58
24"x1½"x2'-0" ℙ
PLAN EAST HOIST SUPPORT
SCALE 1½"=1'-0"
Brg ℙ and anchor bolt sizes and details same as for west hoist support
SHIPS LADDER ELEVATION
SCALE ½"=1'-0"
1½" ϕ Std steel railing 1½" ϕ X-Strong steel pipe posts welded joints
El. 524.5
El. 519.5
L 3x3x¼x4" lg. Weld to stringer and bolt to wall with ½" ϕ expansion bolt.
L 3x3x¼x4" lg. Weld to stringer & bolt to floor with ½" ϕ expansion bolts
Detail "A"
DETAIL "A"
SCALE 1½"=1'-0"
1½" ϕ X-strong std steel pipe post
10 [15.3
TYPICAL TREAD DETAIL
SCALE 1½"=1'-0"
Std grating type tread with 1"x⅛" bearing bars @ 1 3/16" o.c.
Abrasive nosing
End plate punched for ⅜" ϕ bolts
10 [15.3 Stringer
GRAPHIC SCALES
1/4"=1'-0"
1/2"=1'-0"
3/4"=1'-0"
1"=1'-0"
1 1/2"=1'-0"
3"=1'-0"

NOTE:
All steel shown on this sheet will be paid for under Item No. 74 with the exception of pipe railing which will be paid for under item No 73.

REVISION	DATE	DESCRIPTION

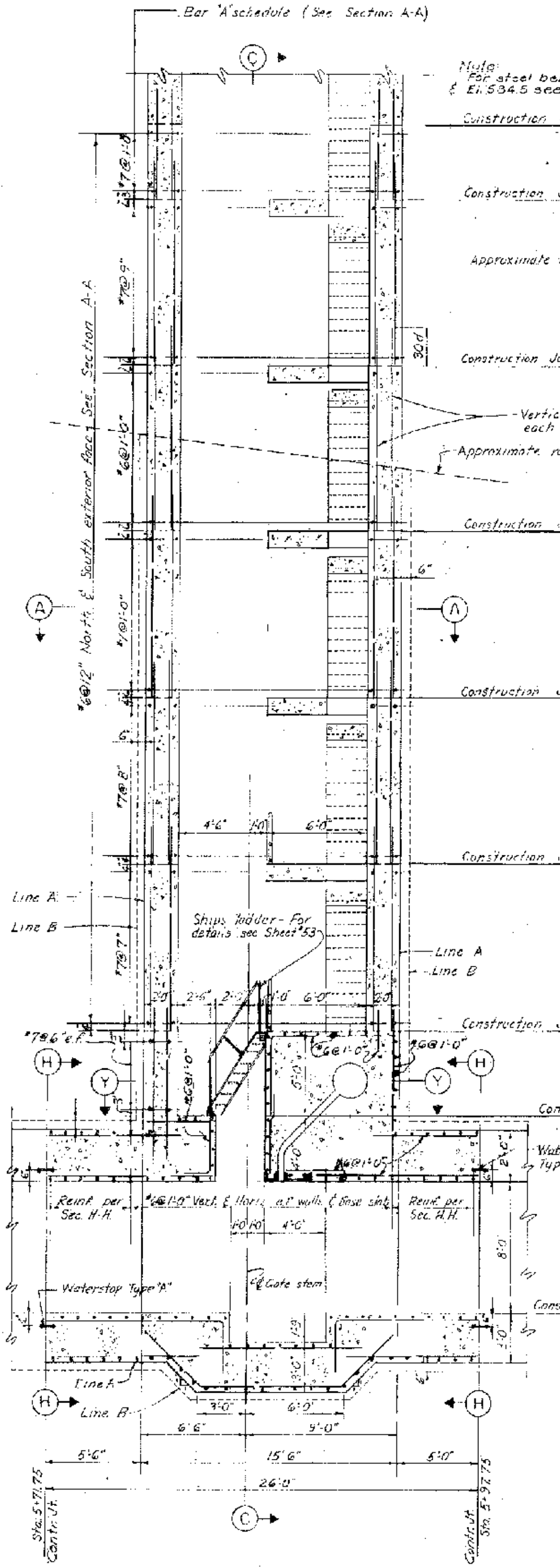
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY C.C.C. | DR. BY E.W.S. | CK. BY
SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

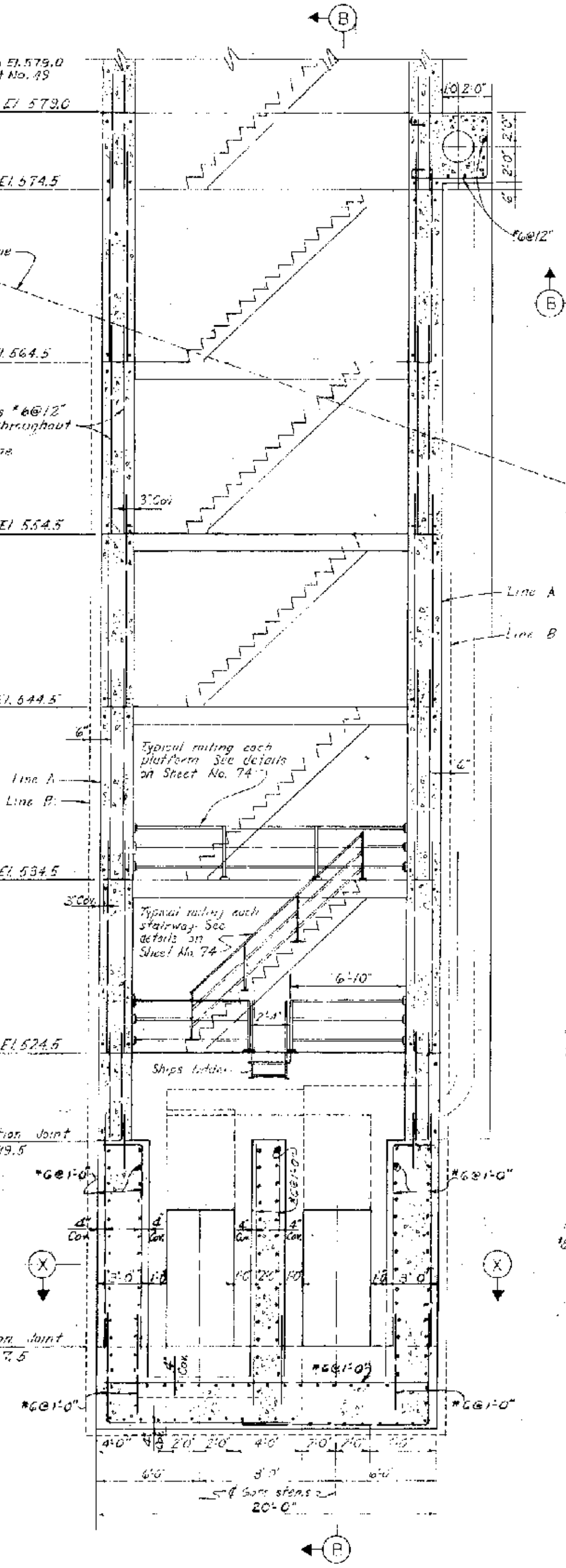
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL OUTLET WORKS
STRUCTURAL
MISCELLANEOUS METALS DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

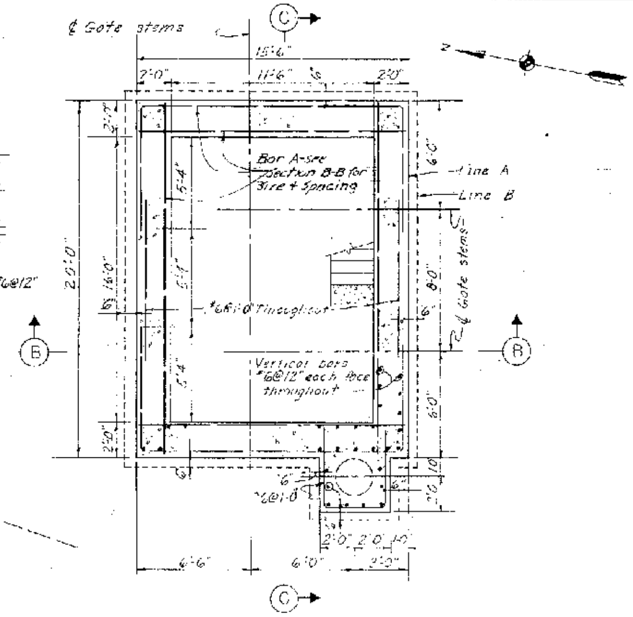
SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5759
SHEET 53


Bar "A" schedule (See Section A-A)
Note: For steel between El. 579.0 & El. 534.5 see Sheet No. 49
Construction Joint El. 579.0
Construction Joint El. 574.5
Approximate rock line
Construction Joint El. 564.5
Vertical bars #6@12" each face throughout
Approximate rock line
Construction Joint El. 554.5
#6@12" North & South exterior face. See Section A-A
Construction Joint El. 544.5
Construction Joint El. 534.5
Line A
Line B
Ships ladder - For details see Sheet 53
Construction Joint El. 524.5
Construction Joint El. 519.5
Waterstop Type "A"
Reinf. per Sec. H-H
#6@1'-0" Vert. & Horiz. at walls & base slab
Gate stem
Waterstop Type "A"
Construction Joint El. 507.5
5'-6"
6'-6"
15'-6"
9'-0"
5'-0"
26'-0"
Sta. 5+71.75 Contr. Jt.
Contr. Jt. Sta. 5+97.75

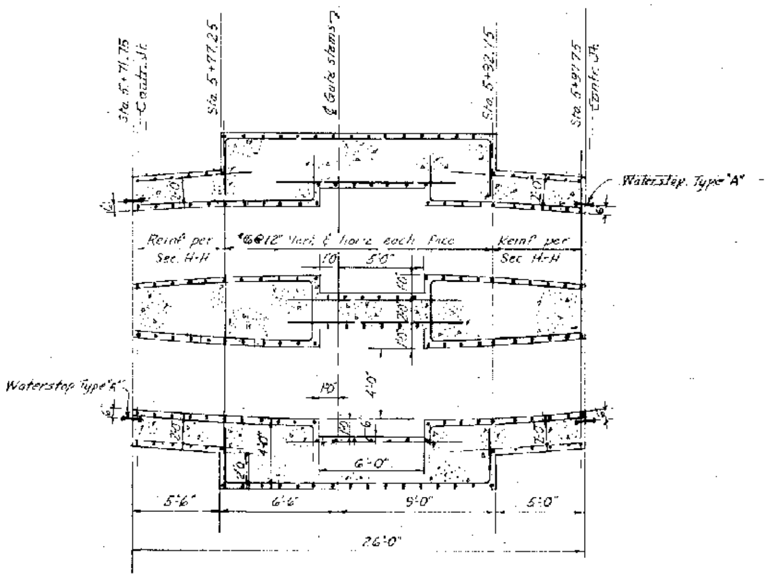
SECTION B-B
SCALE 1/4" = 1'-0"


#6@12"
3" Cov.
Line A
Line B
Typical railing each platform. See details on Sheet No. 74
Typical railing each stairway. See details on Sheet No. 74
6'-10"
Ships ladder
#6@1'-0"
20'-0"
Gate stems

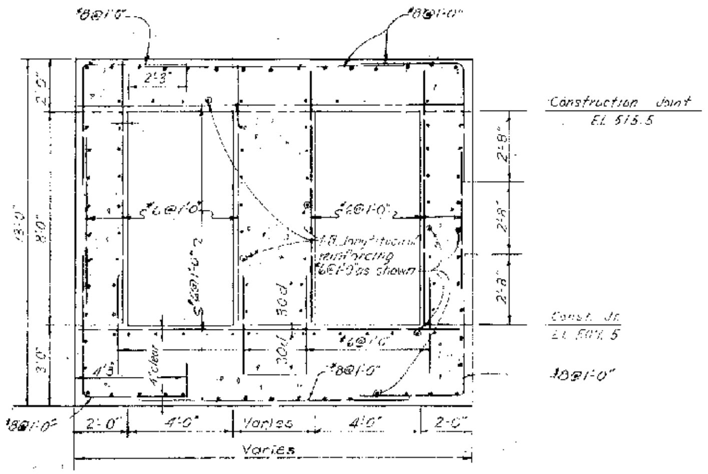
SECTION C-C
SCALE 1/4" = 1'-0"



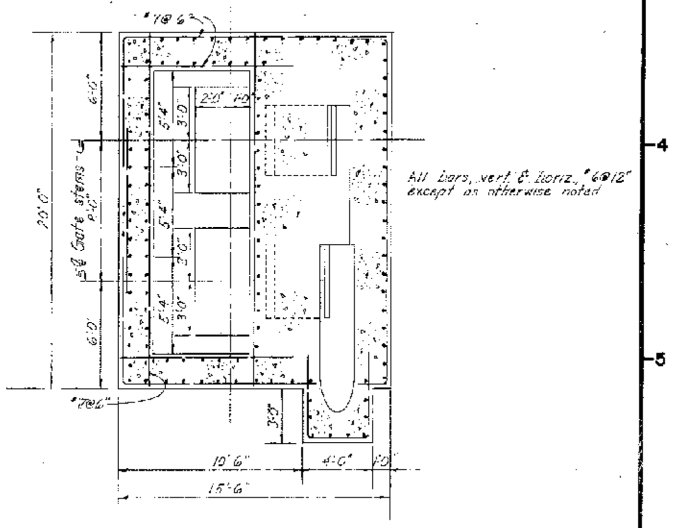
SECTION A-A
SCALE 1/4" = 1'-0"



SECTION X-X
SCALE 1/4" = 1'-0"



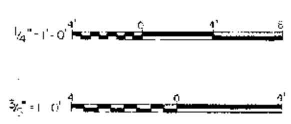
SECTION H-H
AT STA. 5+71.75 AND AT STA. 5+97.75
SCALE 3/8" = 1'-0"



SECTION Y-Y
SCALE 1/4" = 1'-0"

NOTE
For general notes see Sheet No. 49
For contraction joint detail at Sec. H-H see Sheet No. 80

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

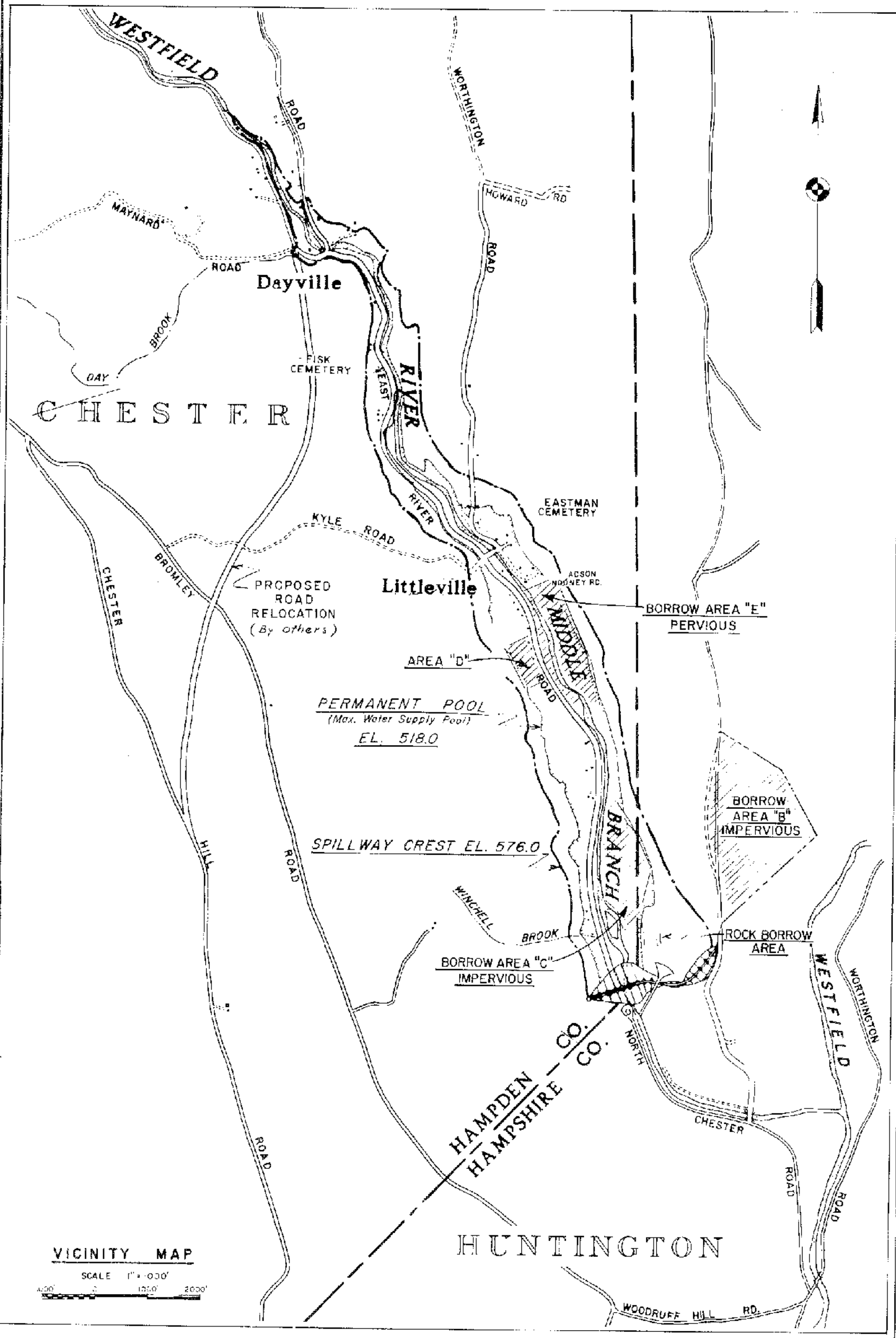
DES. BY	DR. BY	CK. BY
C.C.C.	E.W.S.	

SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
STRUCTURAL
VERTICAL & HORIZONTAL SECTIONS-REINF. DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG 19-016-62-49
DRAWING NUMBER
CT-1-5758
SHEET 52

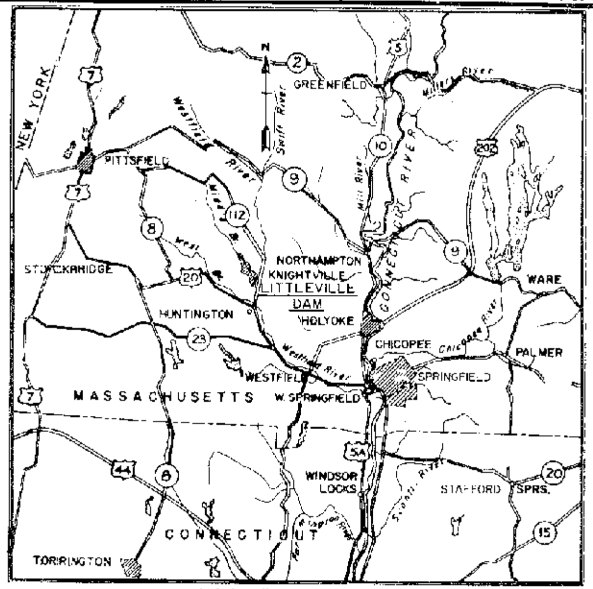


VICINITY MAP

SCALE 1" = 1000'

INDEX TO DRAWINGS

DRAWING NO.	SHEET NO.	TITLE
CT-1-5724	1	PROJECT PLAN AND INDEX
CT- -5725	2	GENERAL PLAN
CT- -5726	3	HYDROGRAPHS NO. 1
CT- -5727	4	" NO. 2
CT-1 5728	5	" NO. 3
CT-1-5729	6	" NO. 4
CT-1-5730	7	" NO. 5
CT-2-1492	8	PLAN OF FOUNDATION EXPLORATIONS
CT-2-1493	9	DAM & DIKE-GEOLOGIC SECTIONS
CT-2-1494	10	CUT-OFF TRENCH-GEOLOGIC-LOG SECTION
CT-2-1495	11	WATER SUPPLY OUTLET WORKS-GEOLOGIC-LOG SECTIONS
CT-2-1496	12	FLOOD CONTROL OUTLET WORKS-GEOLOGIC-LOG SECTIONS
CT-2-1497	13	SPILLWAY-GEOLOGIC-LOG SECTIONS
CT-2-1498	14	RECORD OF FOUNDATION EXPLORATIONS-NO. 1
CT-2-1499	15	" " " " -NO. 2
CT-2-1500	16	" " " " -NO. 3
CT-2-1501	17	" " " " -NO. 4
CT-2-1502	18	" " " " -NO. 5
CT-2-1503	19	" " " " -NO. 6
CT-2-1504	20	PLAN OF BORROW EXPLORATIONS-AREA B
CT-2-1505	21	" " " " -AREAS C, D & E
CT-2-1506	22	RECORD OF BORROW EXPLORATIONS-NO. 1
CT-2-1507	23	" " " " -NO. 2
CT-2-1508	24	" " " " -NO. 3
CT-1-5731	25	EMBANKMENT SECTIONS
CT-1-5732	26	GROUTING PLAN AND DETAILS
CT-1-5733	27	LOG BOOM DETAILS
CT-1-5734	28	DAM AND DIKE PROFILES AND ROTARY DETAILS
CT-1-5735	29	DIKE SECTIONS AND ACCESS ROAD
CT-1-5736	30	PARKING AREA AND FLAG POLE DETAILS
CT-1-5737	31	SPILLWAY-PLAN AND SECTIONS
CT-1-5738	32	" -PROFILE AND SECTIONS
CT-1-5739	33	" -WEIR-SECTIONS
CT-1-5740	34	" -WEST WALL-PLAN, ELEVATIONS AND SECTIONS NO. 1
CT-1-5741	35	" - " " - " " " " NO. 2
CT-1-5742	36	" -EAST " - " " " "
CT-1-5743	37	SPILLWAY-EAST RETAINING WALL-PLAN, ELEVATIONS AND SECTIONS
CT-1-5744	38	FLOOD CONTROL OUTLET WORKS-PLAN AND PROFILE
CT-1-5745	39	FLOOD CONTROL INTAKE STRUCTURE-CONCRETE STAIRS
CT-1-5746	40	" " " " -PLAN, SECTION AND DETAILS
CT-1-5747	41	" " " " -SECTIONS AND REINFORCING DETAILS NO. 1
CT-1-5748	42	" " " " -REINFORCING DETAILS NO. 2
CT-1-5749	43	FLOOD CONTROL TUNNEL AND TRANSITION-SECTIONS AND REINFORCING DETAILS
CT-1-5750	44	FLOOD CONTROL GATE SHAFT-ARCHITECTURAL-PLANS & ELEVATIONS
CT-1 5751	45	" " " " " -SECTIONS & DETAILS
CT-1-5752	46	" " " " " -ENTRANCE DETAILS
CT-1-5753	47	" " " " & WATER SUPPLY TOWER-ARCHITECTURAL-MISCELLANEOUS DETAILS
CT-1-5754	48	FLOOD CONTROL GATE SHAFT-STRUCTURAL-ROOF AND OPERATING FLOOR SLABS-REINFORCING DETAILS
CT-1-5755	49	FLOOD CONTROL GATE SHAFT-STRUCTURAL-BASEMENT FLOOR SLAB-REINFORCING DETAILS
CT-1-5756	50	" " " " -STRUCTURAL-SUPERSTRUCTURE-ELEVATIONS AND SECTIONS-REINFORCING DETAILS
CT-1-5757	51	FLOOD CONTROL GATE SHAFT-STRUCTURAL-PLATFORM, STAIRS & AIR VENT-REINFORCING DETAILS
CT-1-5758	52	" " " " -STRUCTURAL-VERTICAL & HORIZONTAL SECTIONS-REINFORCING DETAILS
CT-1-5759	53	FLOOD CONTROL OUTLET WORKS-STRUCTURAL-MISCELLANEOUS METALS DETAILS
CT-1-5760	54	" " GATE SHAFT-AIR VENTS & ACCESSORIES
CT-1-5761	55	" " " " -MECHANICAL-PLANS, SECTIONS & DETAILS
CT-1-5762	56	" " " " " -GATE ASSEMBLY & MISCELLANEOUS DETAILS
CT-1-5763	57	" " " " -ELECTRICAL-PLANS & SECTIONS
CT-1 5764	58	FLOOD CONTROL OUTLET PORTAL-PLAN & SECTIONS
CT-1-5765	59	" " " " -SECTIONS
CT-1-5766	60	WATER SUPPLY AND SERVICE BRIDGE-PLAN & PROFILE
CT-1-5767	61	WATER SUPPLY INTAKE TOWER-PLAN & SECTIONS
CT-1 5768	62	" " " " -RETAINING WALLS
CT-1-5769	63	" " " " -ARCHITECTURAL-PLAN & DETAILS
CT-1-5770	64	" " " " " -ELEVATION & SECTION
CT-1-5771	65	" " " " - " -ENTRANCE DETAILS
CT-1-5772	66	" " " " -STRUCTURAL-ROOF & OPERATING FLOOR SLABS-REINFORCING DETAILS
CT-1-5773	67	" " " " -STRUCTURAL HEATER ROOM & GATE WELL FLOOR SLABS-REINFORCING DETAILS
CT-1-5774	68	WATER SUPPLY INTAKE TOWER-STRUCTURAL-SUPERSTRUCTURE-ELEVATIONS & SECTIONS-REINFORCING DETAILS
CT-1-5775	69	WATER SUPPLY INTAKE TOWER-STRUCTURAL-PLATFORM & STAIRS-REINFORCING DETAILS
CT-1-5776	70	" " " " - " -BASE SLAB & WALL-REINFORCING DETAILS
CT-1-5777	71	" " " " - " -VERTICAL SECTIONS NO. 1
CT-1-5778	72	" " " " - " " NO. 2
CT-1-5779	73	" " " " & F.C. GATE SHAFT MISCELLANEOUS METALS-DETAILS NO. 1
CT-1-5780	74	" " " " & F.C. GATE SHAFT-STRUCTURAL-MISCELLANEOUS METALS-DETAILS NO. 2
CT-1-5781	75	" " " " -MECHANICAL-PLANS & SECTIONS
CT-1-5782	76	" " " " - " -GATE ASSEMBLIES & MISCELLANEOUS DETAILS
CT-1-5783	77	" " " " -ELECTRICAL-PLANS & SECTIONS
CT-1-5784	78	" " " " -FLOAT WELL & ACCESSORIES
CT-1-5785	79	" " " " -TILE GAGES
CT-1-5786	80	WATER SUPPLY CONDUIT-PLAN & SECTIONS NO. 1
CT-1-5787	81	" " " - " " " NO. 2
CT-1-5788	82	" " " - " " " NO. 3
CT-1-5789	83	WATER SUPPLY OUTLET PORTAL-PLAN & SECTIONS



LOCATION MAP

SCALE 1 IN. = 8 MI.

8 0 8 16

INDEX CONTINUED

DRAWING NO.	SHEET NO.	TITLE
CT-1-5790	84	ELECTRICAL DISTRIBUTION SYSTEM-PLAN & ONE LINE DIAGRAM
CT-1-5791	85	" " " -MISCELLANEOUS DETAILS NO. 1
CT-1-5792	86	" " " - " " NO. 2
CT-1-5793	87	ACCESS BRIDGE ABUTMENTS-PLAN & DETAILS
CT-1-5794	88	ACCESS BRIDGE-STRUCTURAL STEEL DETAILS NO. 1
CT-1-5795	89	" " - " " " NO. 2
CT-1-5796	90	ACCESS & SERVICE BRIDGES-STRUCTURAL-BEARING & ABUTMENT DETAILS
CT-1-5797	91	SERVICE BRIDGE-STRUCTURAL STEEL DETAILS NO. 1
CT-1-5798	92	" " - " " " NO. 2
CT-1-5799	93	" " -STRUCTURAL-PIERS & ABUTMENT DETAILS
CT-1-5800	94	GOSS HILL ROAD IMPROVEMENT-PLAN & PROFILE NO. 1
CT-1-5801	95	" " " " - " " " NO. 2
CT-1-5802	96	" " " " - " " " NO. 3
CT-1-5803	97	" " " " - " " " NO. 4
CT-1-5804	98	MAINTENANCE ROAD-PROFILE, SECTIONS & DETAILS
CT-1-5805	99	UTILITY BUILDING-SITE PLAN
CT-1-5806	100	" " -PLANS, SECTIONS & DETAILS
CT-1-5807	101	" " -ELEVATIONS & DETAILS
CT-1-5808	102	" " -SECTIONS & DETAILS
CT-1-5809	103	" " -STRUCTURAL DETAILS
CT-1-5810	104	" " -PLUMBING & HEATING
CT-1-5811	105	" " -ELECTRICAL-PLAN & SECTIONS
CT-1-5812	106	OPERATORS QUARTERS-SITE PLAN
CT-1-5813	107	" " -FLOOR PLANS, ELEVATIONS & SECTIONS
CT-1-5814	108	" " -FRAMING PLANS, SECTIONS & DETAILS
CT-1-5815	109	" " -ELECTRICAL PLAN
CT-1-5816	110	" " -PLUMBING & HEATING
CT-1-5817	111	GARAGE-PLANS, ELEVATIONS, SECTIONS & DETAILS

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY | DR. BY | CK. BY

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
PROJECT PLAN AND INDEX

MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

PROJECT ENGINEER J. Hartler

APPROVAL RECOMMENDED J. C. Ingersoll
CHIEF, P. & S. BRANCH

APPROVED
CHIEF, ENGINEERING DIVISION

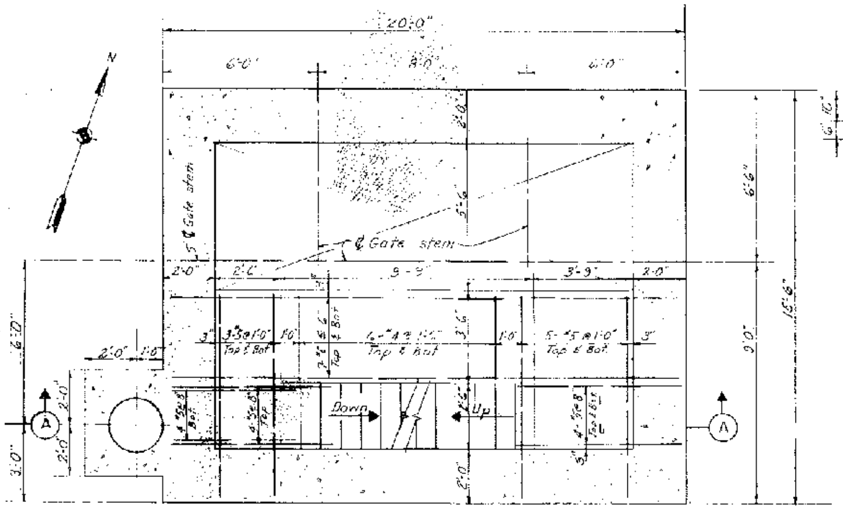
DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-

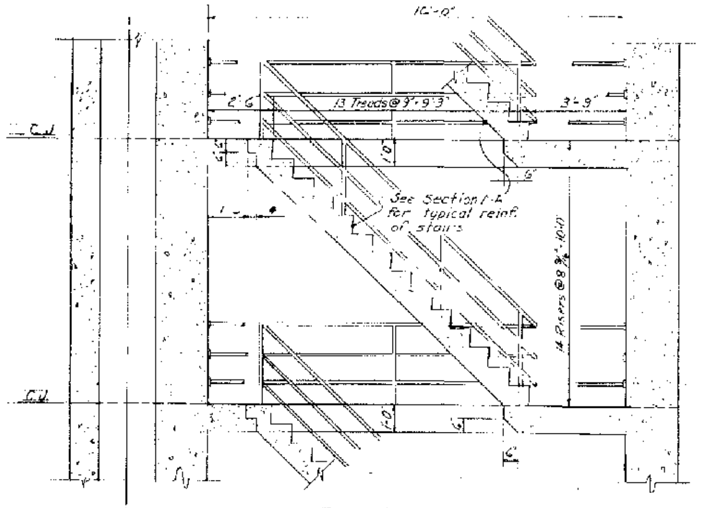
DRAWING NUMBER
CT-1-5724

SHEET 1

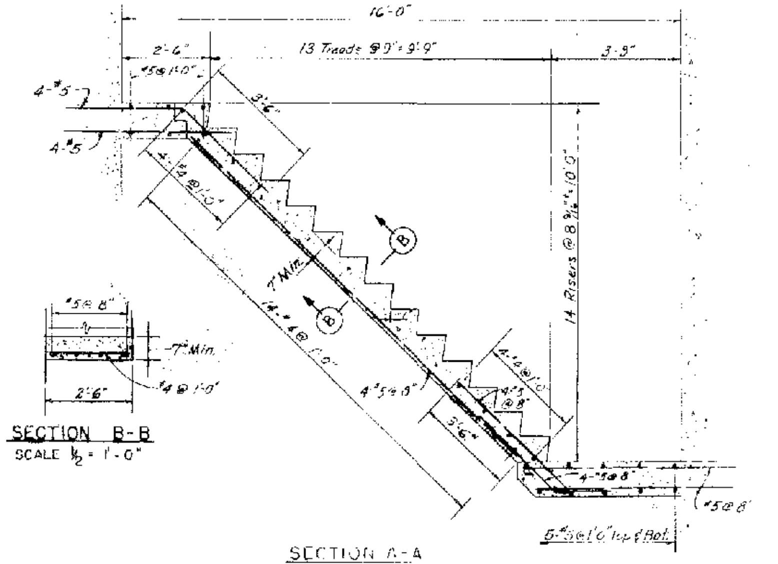
CORPS OF ENGINEERS U. S. ARMY



PLAN - TYPICAL GATE WELL LANDING
SCALE 3/8" = 1'-0"

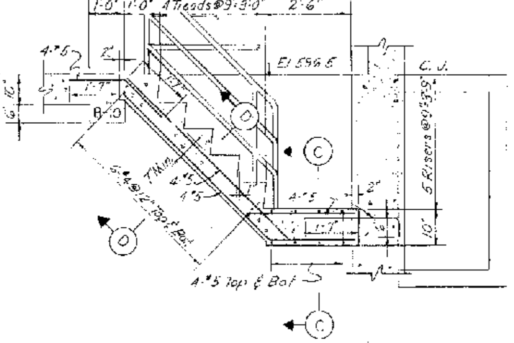

16'-0"
C.J.
13 Treads @ 9" = 9'-9"
2'-6"
3'-9"
See Section A-A for typical reinf. of stairs
14 Risers @ 8 9/14" = 10'-0"

TYPICAL STAIRWAY
SCALE 3/8" = 1'-0"

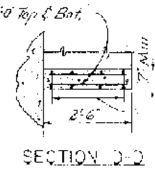


SECTION B-B
SCALE 1/2" = 1'-0"

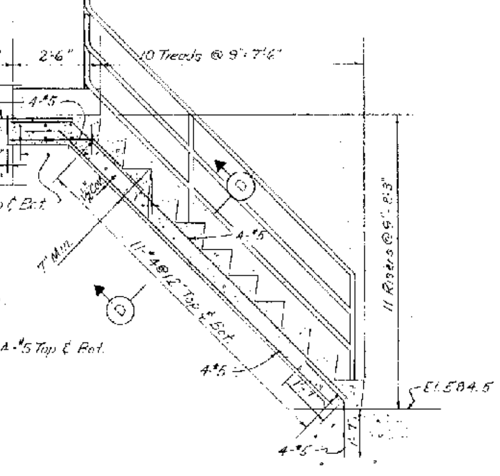
SECTION A-A
TYPICAL FOR 6 FLIGHTS
ELEV. 524.5 TO ELEV. 584.5
SCALE 1/2" = 1'-0"



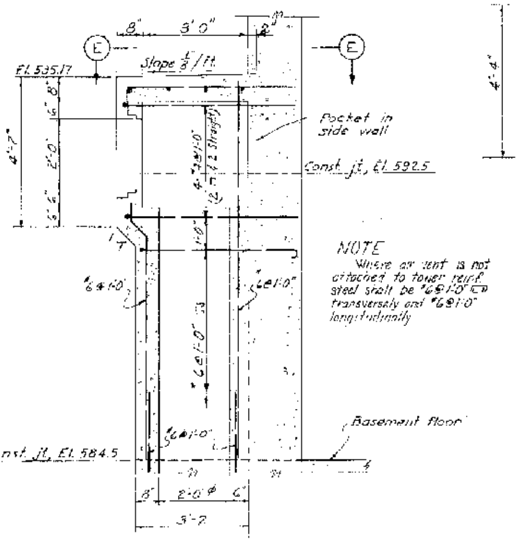
SECTION (4/4B)
SCALE 1/2" = 1'-0"



SECTION D-D
SCALE 1/2" = 1'-0"

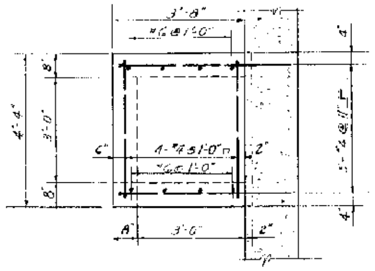


SECTION C-C
SCALE 1/2" = 1'-0"



NOTE
Where air vent is not attached to tower reinf. steel shall be "#6@1'-0" C.P. transversely and "#6@1'-0" longitudinally

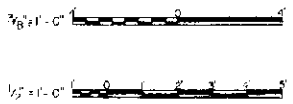
SECTION (Z/5C)



PLAN E-E

AIR VENT DETAILS
SCALE 1/2" = 1'-0"

GRAPHIC SCALES



NOTES:

For general notes applying to this sheet, see Sheet No. 48.
For typical interior pipe railing details, see Sheet No. 74
Payment for railing will be made under Item No. 73.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

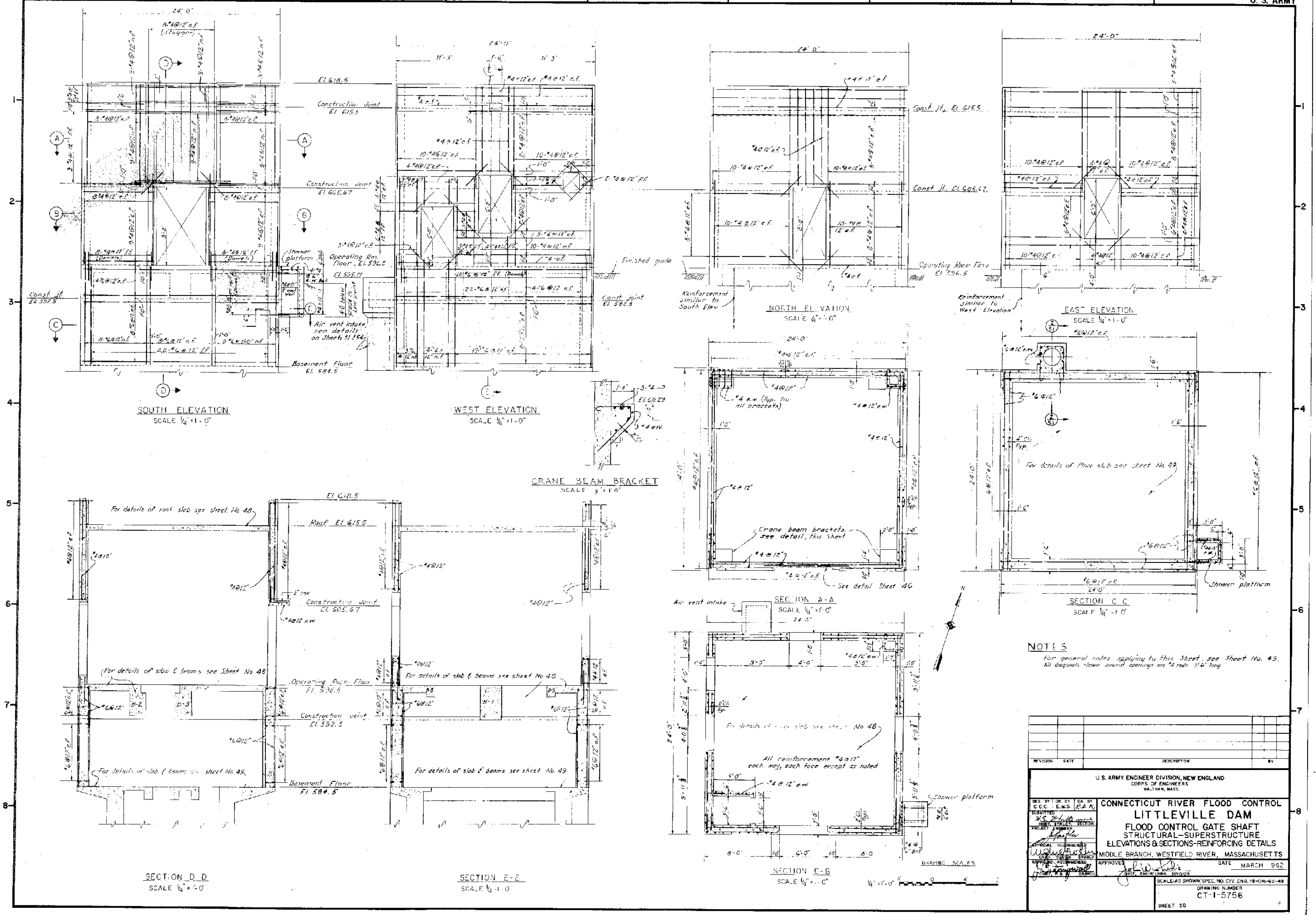
DES. BY C.C.C. DR. BY E.W.S. CK. BY R.A.K.

SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, E. & M. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
STRUCTURAL
PLATFORM, STAIRS AND AIR VENT-REINF. DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5757
SHEET 51


CORPS OF ENGINEERS
U. S. ARMY
SOUTH ELEVATION
SCALE 1/4" = 1'-0"
WEST ELEVATION
SCALE 1/4" = 1'-0"
NORTH ELEVATION
SCALE 1/4" = 1'-0"
EAST ELEVATION
SCALE 1/4" = 1'-0"
CRANE BEAM BRACKET
SCALE 3/4" = 1'-0"
SECTION A-A
SCALE 1/4" = 1'-0"
SECTION C-C
SCALE 1/4" = 1'-0"
SECTION B-B
SCALE 1/4" = 1'-0"
SECTION D-D
SCALE 1/4" = 1'-0"
SECTION E-E
SCALE 1/4" = 1'-0"
GRAPHIC SCALES
24'-0"
El. 618.5
Construction Joint El. 615.5
Construction Joint El. 606.67
Operating Rm. Floor, El. 596.5
Const. jt. El. 597.5
Basement Floor El. 584.5
Shower platform
Air vent intake see details on Sheets 51 & 54
Finished grade
Const. joint El. 592.5
Const. Jt. El. 615.5
Const. Jt. El. 606.67
Operating Room Floor El. 596.5
Reinforcement similar to South Elev.
Reinforcement similar to West Elevation
Crane beam brackets see detail, this sheet
See detail Sheet 46
#4 e.w. (Typ. for all brackets)
For details of Floor slab see sheet No. 49
Air vent intake
For details of floor slab see sheet No. 48
All reinforcement #4@12" each way, each face except as noted
For details of roof slab see sheet No. 48
Roof El. 615.5
Construction Joint El. 605.67
For details of slab & beams see Sheet No. 48
Operating Room Floor El. 596.5
Construction Joint El. 592.5
For details of slab & beams see sheet No. 49
Basement Floor El. 584.5
El. 611.29

NOTES

For general notes applying to this Sheet, see Sheet No. 49.
All diagonals shown around openings are #4 rods 3'-6" long

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

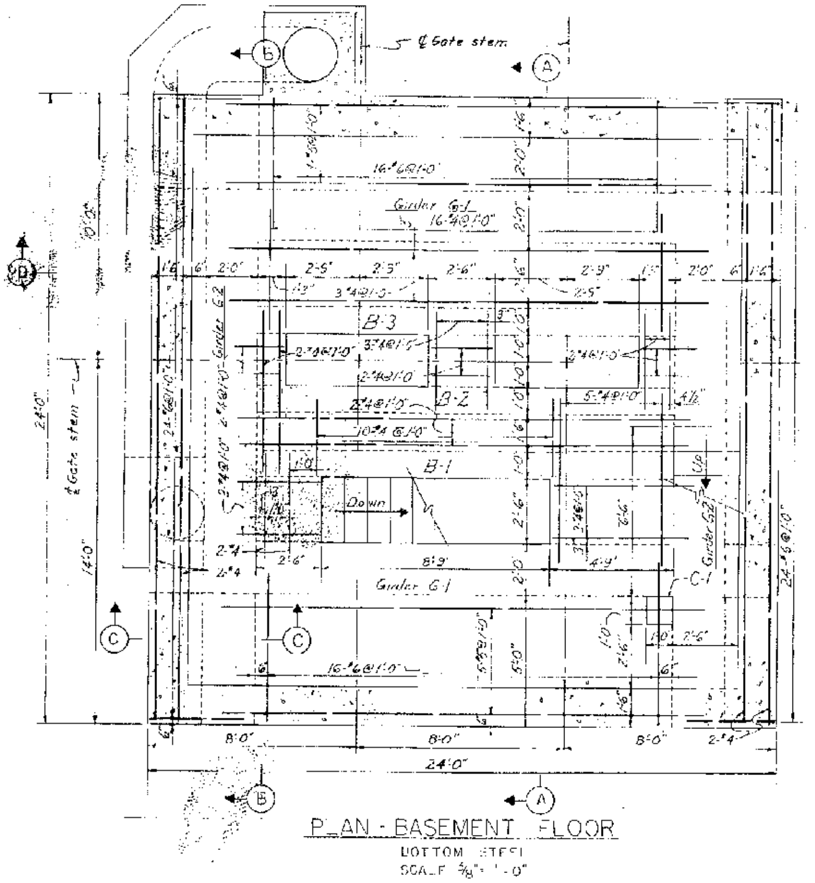
DES. BY C.C.C. | DR. BY E.W.S. | CK. BY R.A.K.
SUBMITTED H. E. Whittemore CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED CHIEF, E. B. ... BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
STRUCTURAL-SUPERSTRUCTURE
ELEVATIONS & SECTIONS-REINFORCING DETAILS

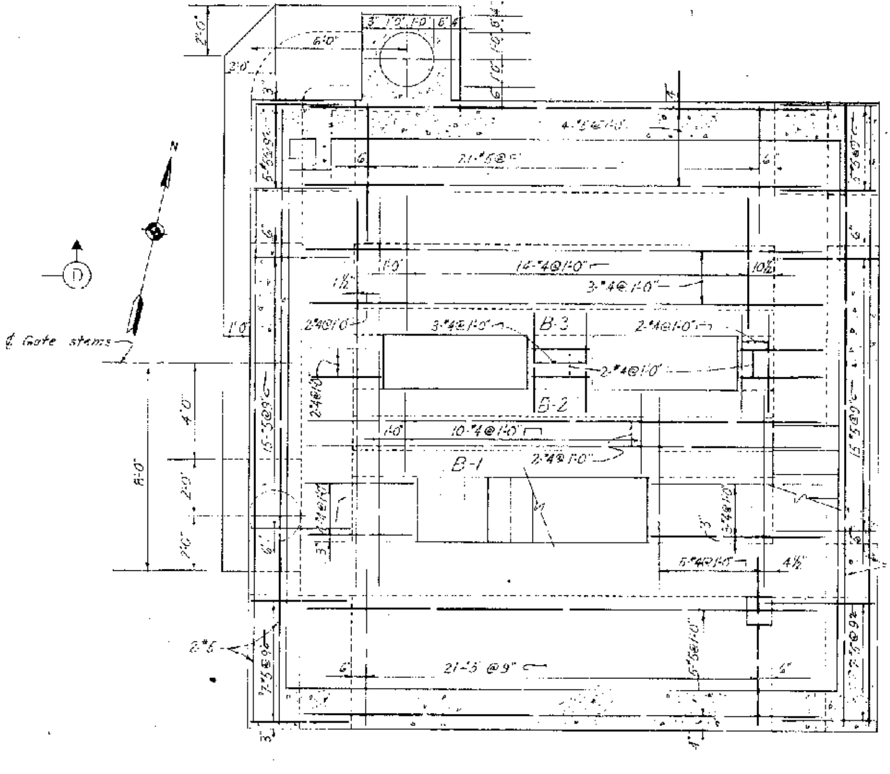
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED John W. ... CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

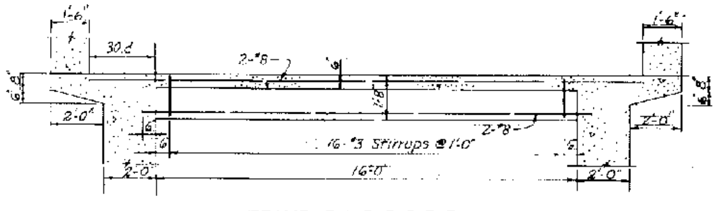
SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5756
SHEET 50



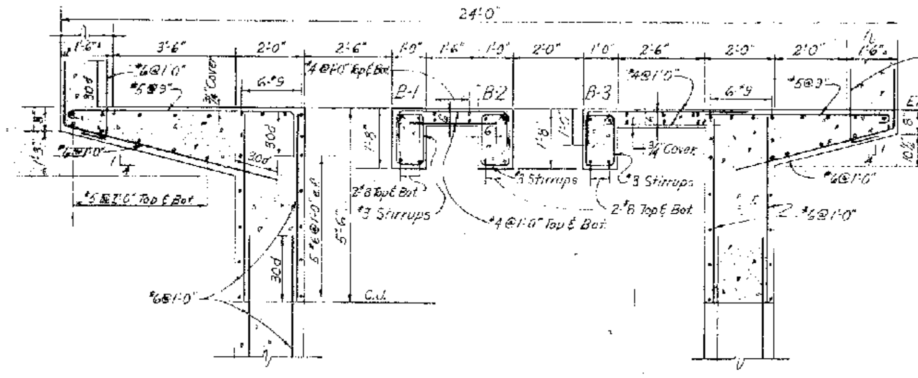
PLAN - BASEMENT FLOOR
BOTTOM STEEL
SCALE 3/8" = 1'-0"



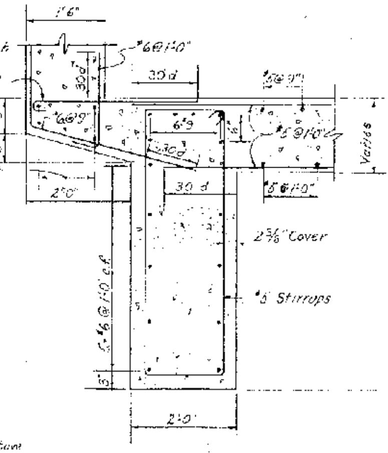
PLAN - BASEMENT FLOOR
TOP STEEL
SCALE 3/8" = 1'-0"



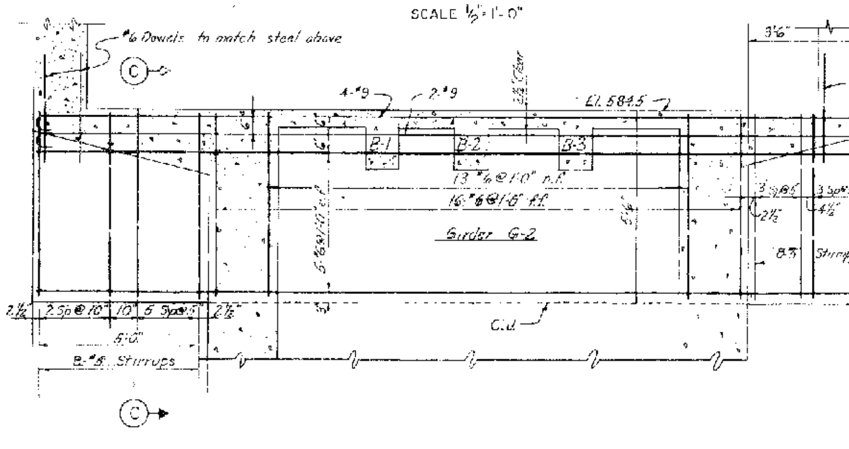
BEAMS B-1, B-2 & B-3
SCALE 3/8" = 1'-0"



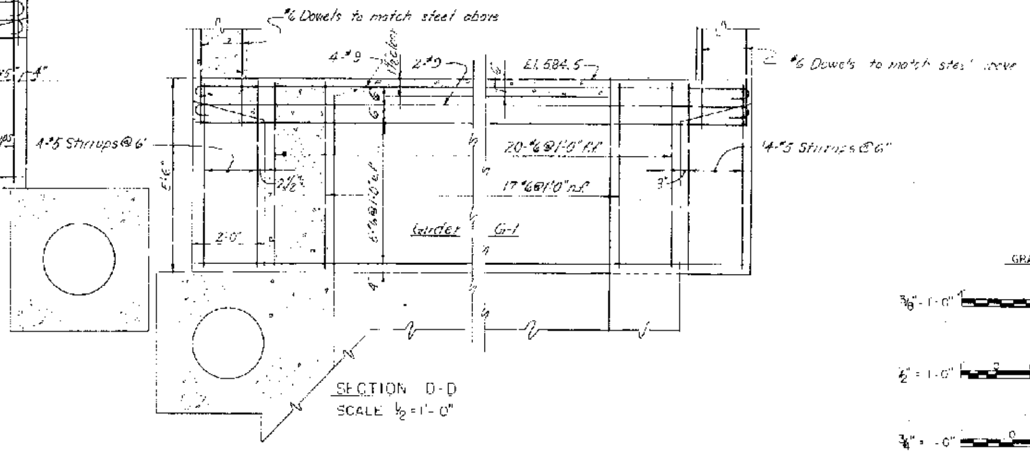
SECTION A-A
SCALE 1/2" = 1'-0"



SECTION C-C
SCALE 3/4" = 1'-0"



SECTION B-B
SCALE 1/2" = 1'-0"



SECTION D-D
SCALE 1/2" = 1'-0"

GENERAL NOTES

Elevations refer to Mean Sea Level Datum.

Payment for furnishing, bending and placing of all steel reinforcement will be made under Item No. 64.

Payment for concrete, except light weight concrete, will be made under the following Item Numbers:-

Below El. 519.5	Item No. 51
Between El. 519.5 and El. 564.5	Item No. 52
Between El. 564.5 and El. 579.0	Item No. 53
Above El. 579.0	Item No. 54

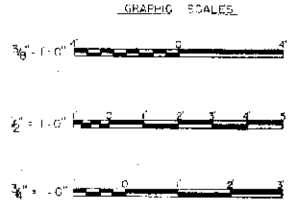
Figures in hexagons indicate item numbers under which payment will be made.

Bar splices shall lap 30 diameters of the smaller bar.

All interior construction joints and all exterior construction joints below finished grade to be smooth joints. All exposed exterior construction joints below El. 581.0 shall conform to details shown on Sheet No. 34. All construction joints above El. 581.0 on the W.S. tower and above El. 506.0 on the F.C. shaft shall conform to the architectural details.

Location, number and size of dowels for equipment bases will be furnished later.

The cover for concrete reinforcement shall be 4" except as noted otherwise.



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

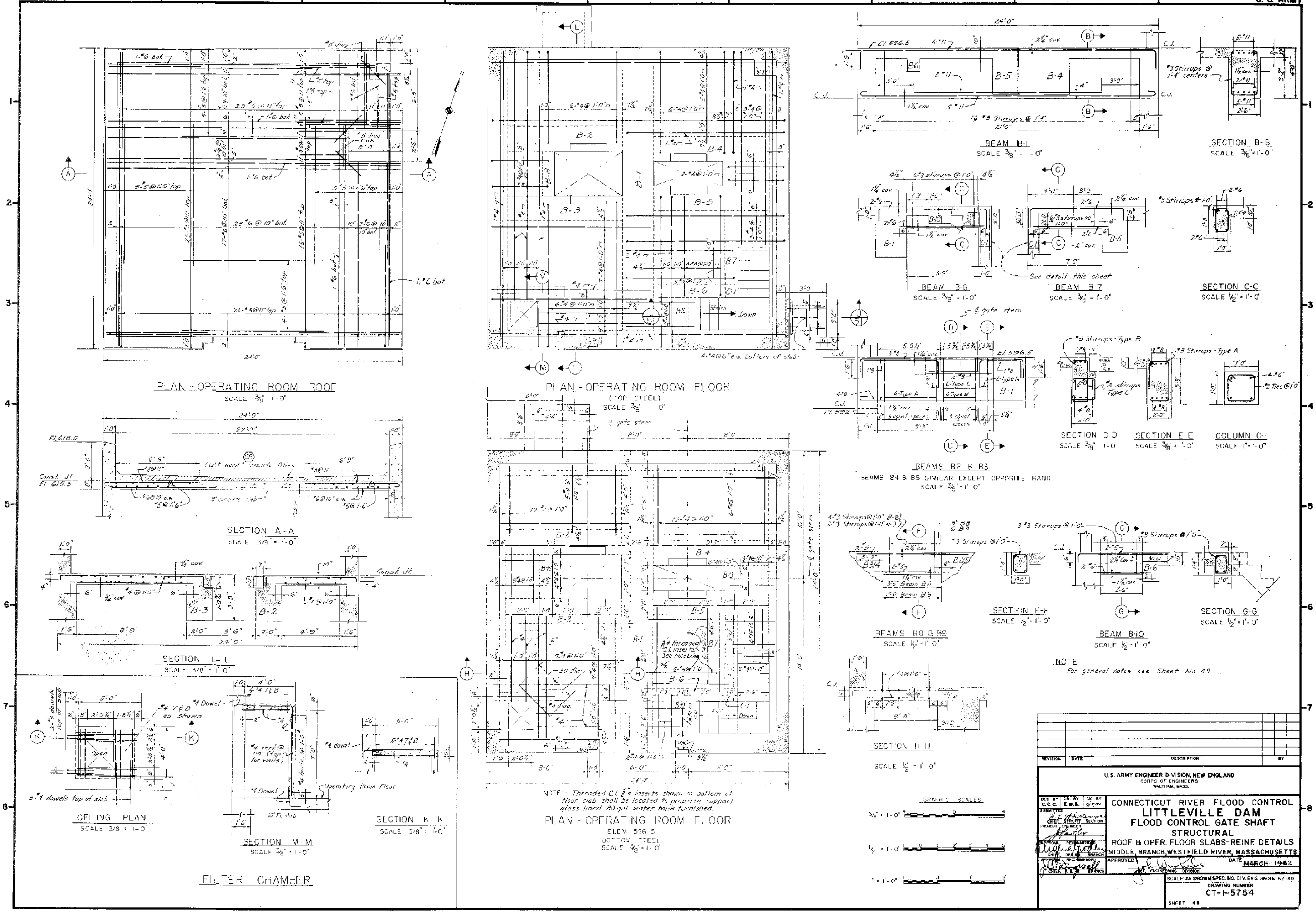
DES. BY	DR. BY	CK. BY
C.C.C.	E.W.S.	

SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER
RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
STRUCTURAL
BASEMENT FLOOR SLAB-REINF. DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5755
SHEET 48



PLAN - OPERATING ROOM ROOF
SCALE 3/8" = 1'-0"

SECTION A-A
SCALE 3/8" = 1'-0"

SECTION L-L
SCALE 3/8" = 1'-0"

CEILING PLAN
SCALE 3/8" = 1'-0"

SECTION M-M
SCALE 3/8" = 1'-0"

SECTION K-K
SCALE 3/8" = 1'-0"

FILTER CHAMBER

PLAN - OPERATING ROOM FLOOR
(TOP STEEL)
SCALE 3/8" = 1'-0"

NOTE:- Threaded C.I. 5/8" inserts shown in bottom of floor slab shall be located to properly support glass lined 80 gal. water tank furnished.

PLAN - OPERATING ROOM FLOOR
ELEV. 596.5
BOTTOM STEEL
SCALE 3/8" = 1'-0"

BEAM B-1
SCALE 3/8" = 1'-0"

SECTION B-B
SCALE 3/8" = 1'-0"

BEAM B-6
SCALE 3/8" = 1'-0"

BEAM B-7
SCALE 3/8" = 1'-0"

SECTION C-C
SCALE 1/2" = 1'-0"

BEAMS B2 & B3
BEAMS B4 & B5 SIMILAR EXCEPT OPPOSITE HAND
SCALE 3/8" = 1'-0"

SECTION D-D
SCALE 3/8" = 1'-0"

SECTION E-E
SCALE 3/8" = 1'-0"

COLUMN C-1
SCALE 1" = 1'-0"

BEAMS B8 & B9
SCALE 1/2" = 1'-0"

SECTION F-F
SCALE 1/2" = 1'-0"

BEAM B-10
SCALE 1/2" = 1'-0"

SECTION G-G
SCALE 1/2" = 1'-0"

SECTION H-H
SCALE 1/2" = 1'-0"

NOTE
For general notes see Sheet No. 49

GRAPHIC SCALES
3/8" = 1'-0"
1/2" = 1'-0"
1" = 1'-0"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

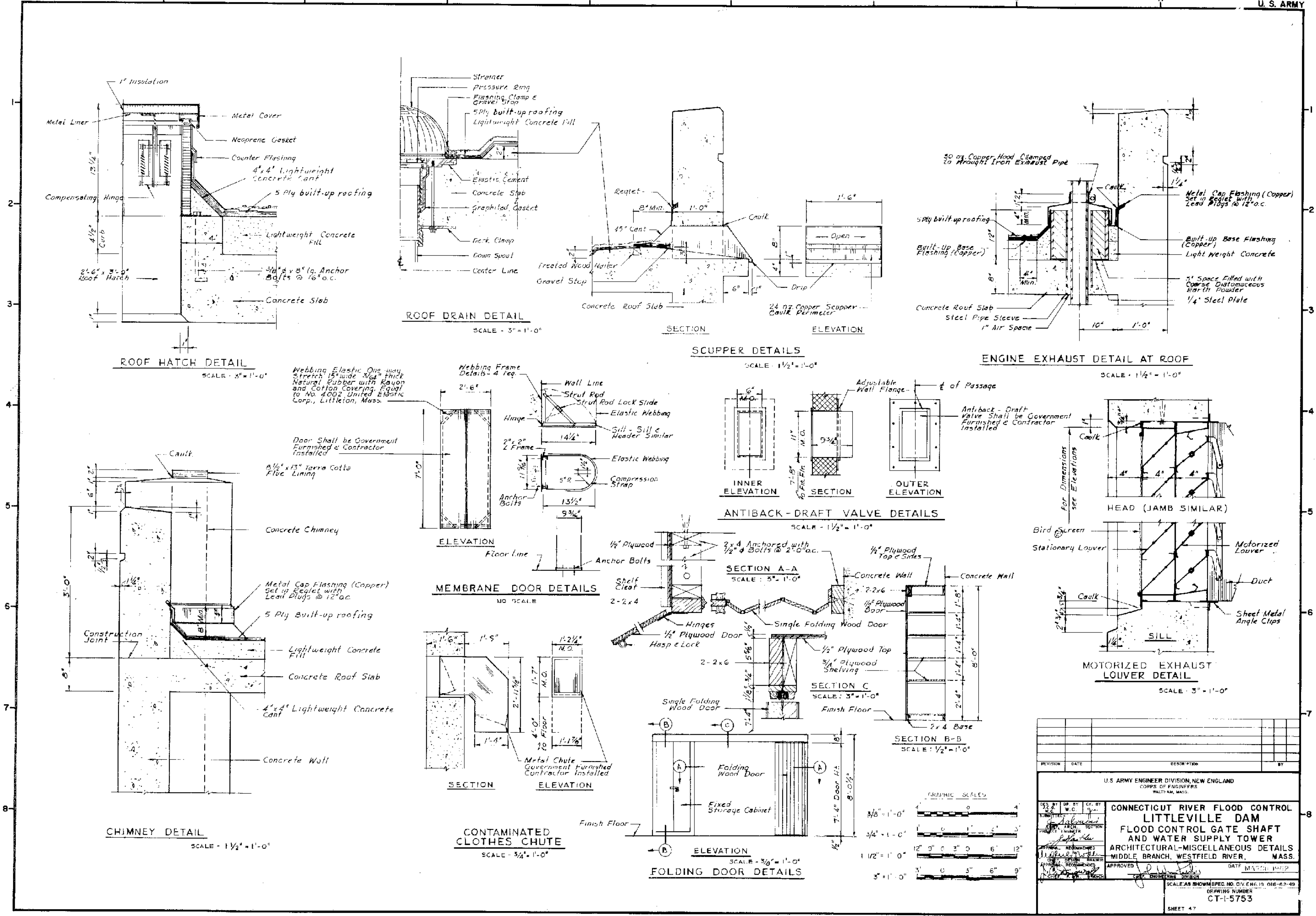
DES. BY	DR. BY	CK. BY
C.C.C.	E.W.S.	

SUBMITTED
H. E. Whittemore
CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
STRUCTURAL
ROOF & OPER. FLOOR SLABS-REINF. DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-I-5754
SHEET 48



REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.C.G. W.C. | DR. BY W.C. | CK. BY
SUBMITTED: J. Salvucci
CHIEF, ARCH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, E. & M. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
AND WATER SUPPLY TOWER
ARCHITECTURAL-MISCELLANEOUS DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

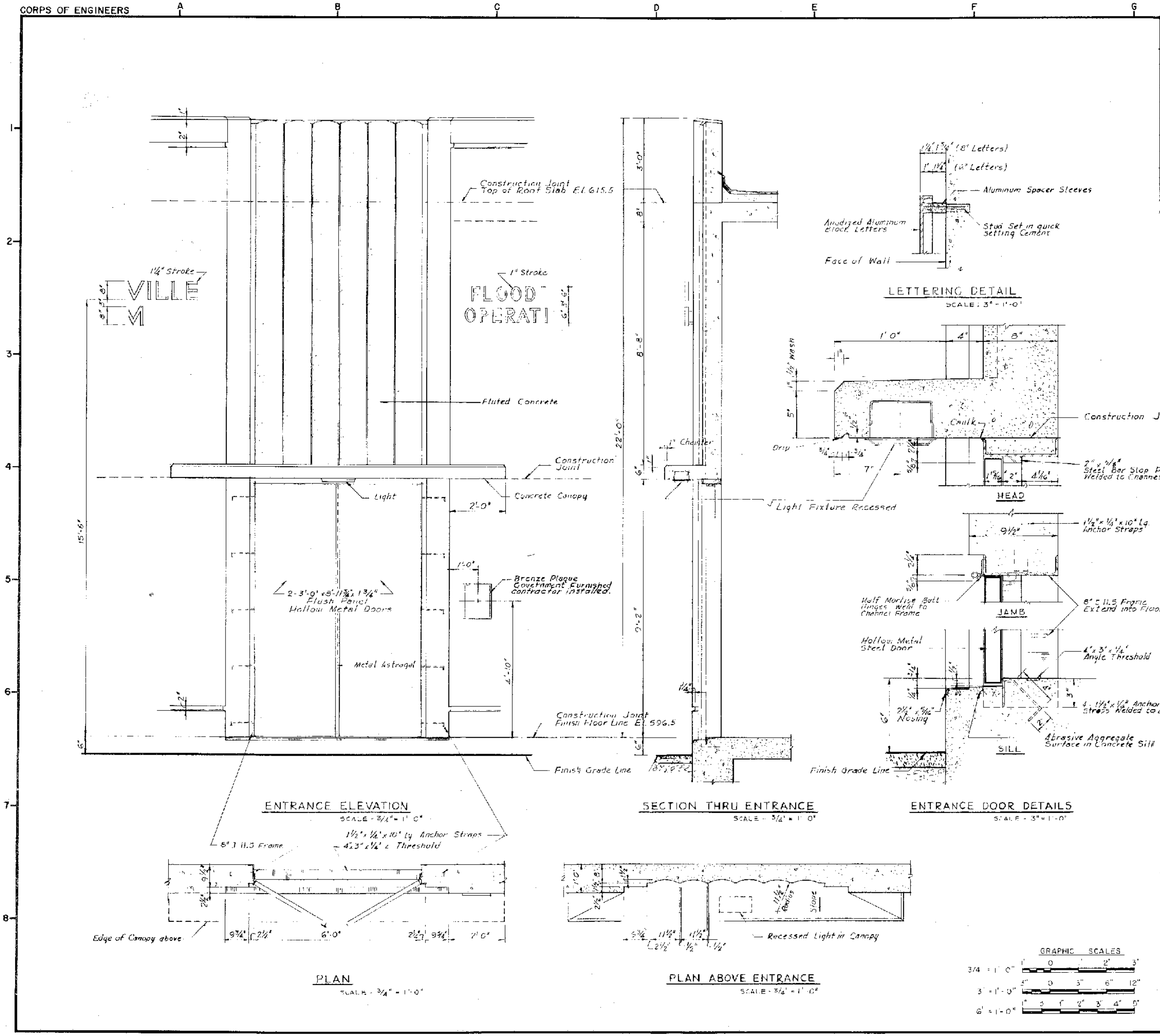
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19 016-62-49
DRAWING NUMBER
CT-1-5753
SHEET 47

DOOR SCHEDULE.

NO.	SIZE	DESCRIPTION	REMARKS
①	Pair 3'-0"x 8'-11¾"	Flush Panel Hollow Metal	Channel Frame (Similar for W.S. TOWER)
②	3'-0"x 7'-0"	Do	Airtight door see Detail
③	2'-2"x 6'-10"	Do	Airtight door see detail.
④	Do	Do	Do
⑤	Do	Do	Louvered Door
⑥	Do	Do	
⑦	Do	Do	similar for Water supply tower
⑧	9'-0"x 7'-6"	Folding Wood	

Note: Doors 1 thru 7 Shall be 1¾" thick



ENTRANCE ELEVATION
SCALE - 3/4" = 1'-0"

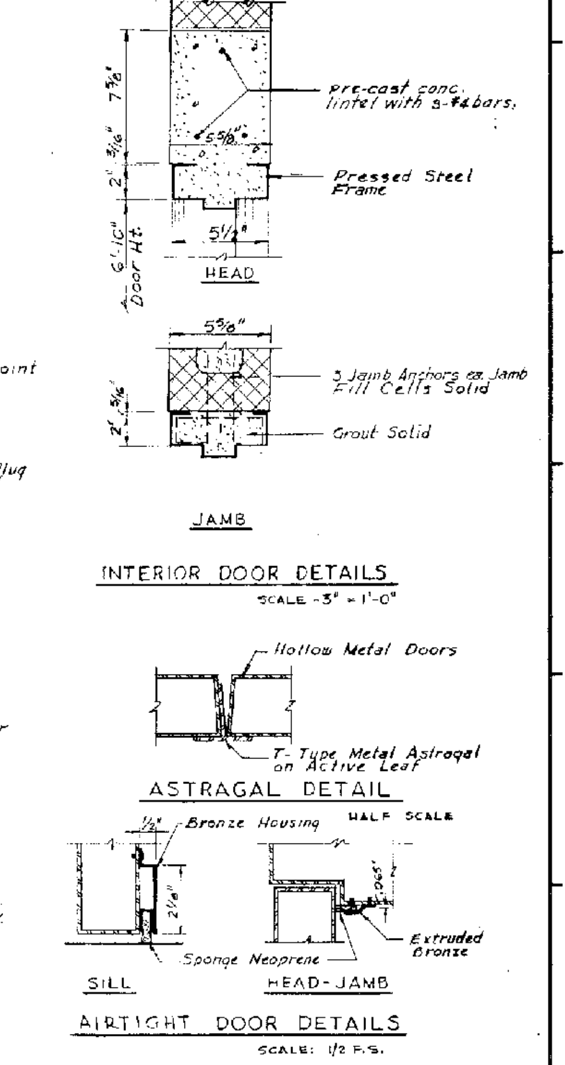
SECTION THRU ENTRANCE
SCALE - 3/4" = 1'-0"

ENTRANCE DOOR DETAILS
SCALE - 3" = 1'-0"

LETTERING DETAIL
SCALE: 3" = 1'-0"

PLAN
SCALE - 3/4" = 1'-0"

PLAN ABOVE ENTRANCE
SCALE - 3/4" = 1'-0"



INTERIOR DOOR DETAILS
SCALE - 3" = 1'-0"

ASTRAGAL DETAIL
HALF SCALE

AIRTIGHT DOOR DETAILS
SCALE: 1/2 F.S.

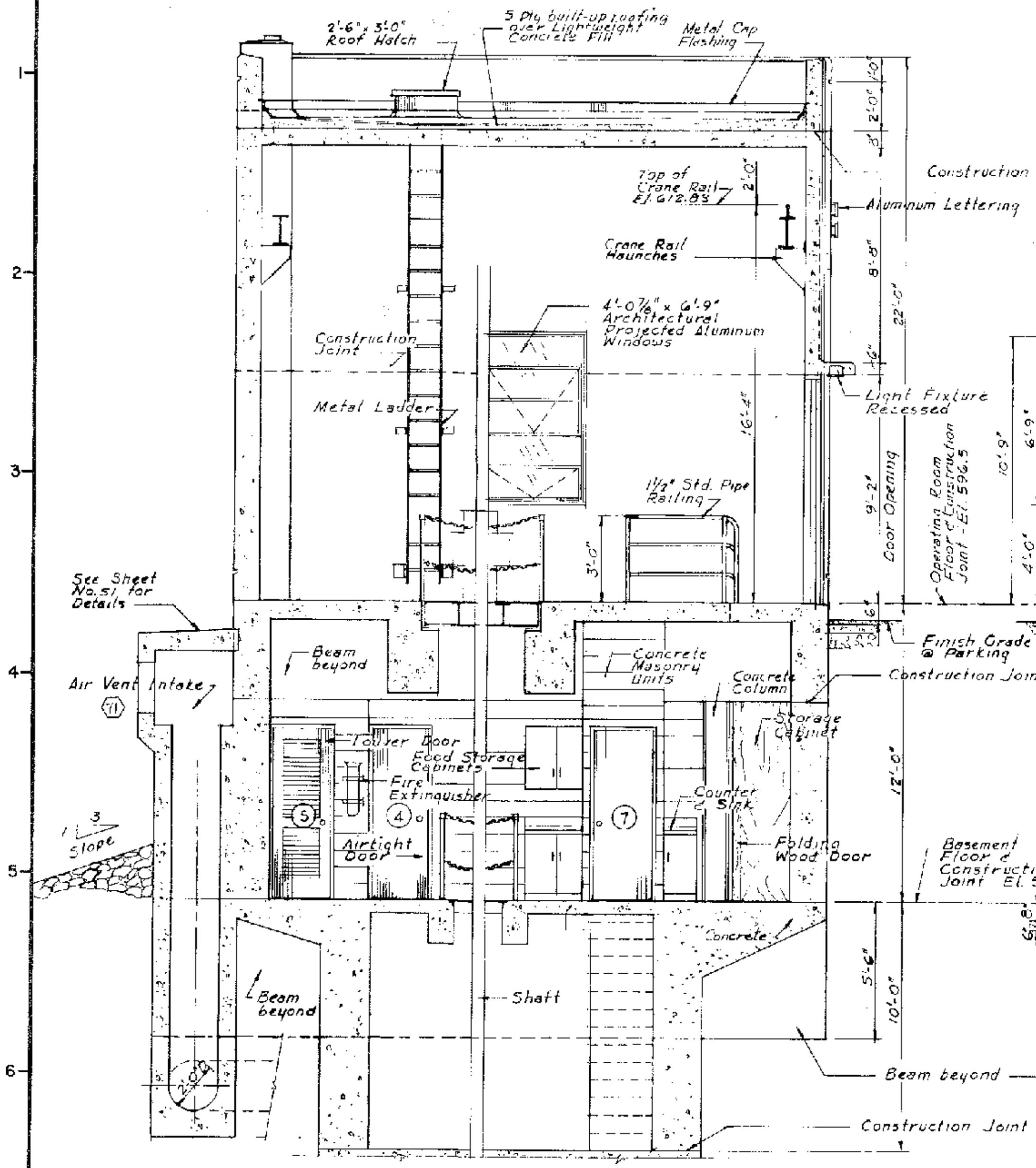
REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.C.G. — DR. BY W.C. — CK. BY
SUBMITTED: CHIEF, ARCH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED: CHIEF, P. & S. BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION

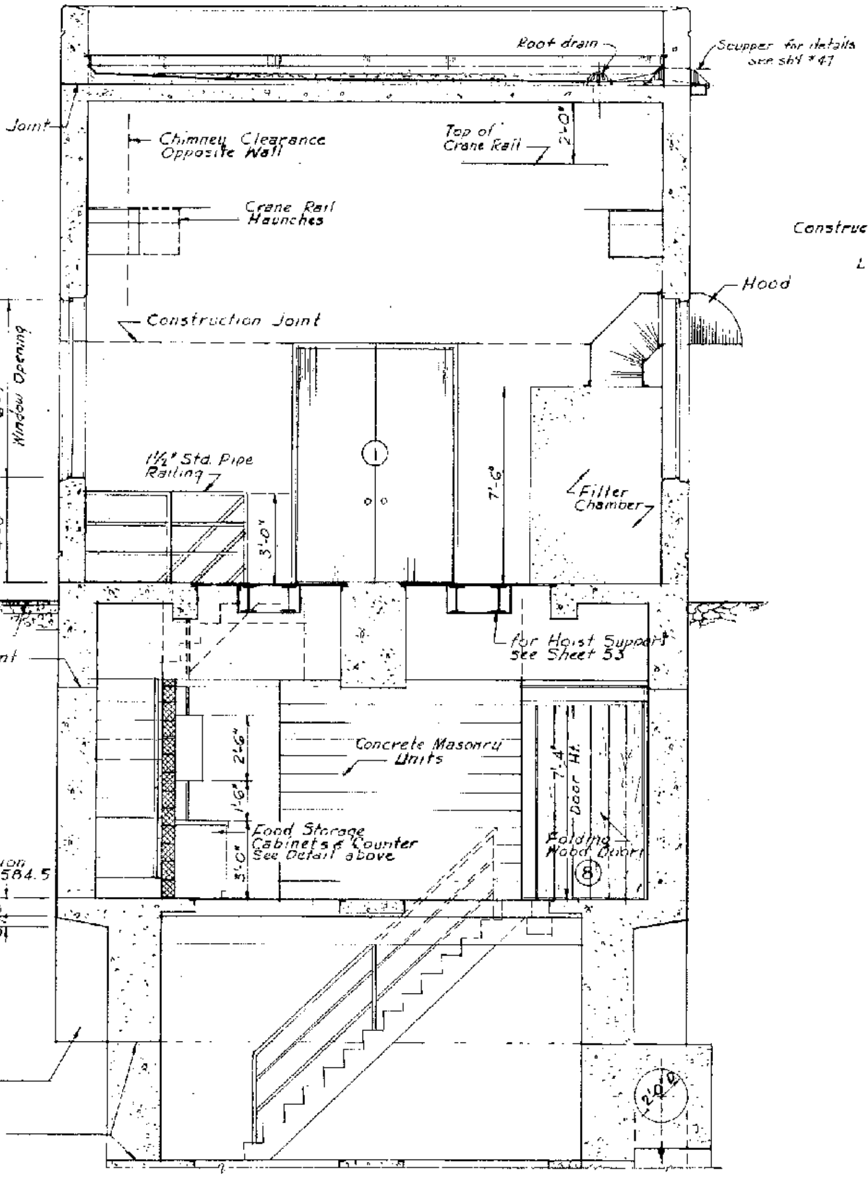
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
ARCHITECTURAL
ENTRANCE DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

DATE MARCH 19[illegible]
SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5752
SHEET 46



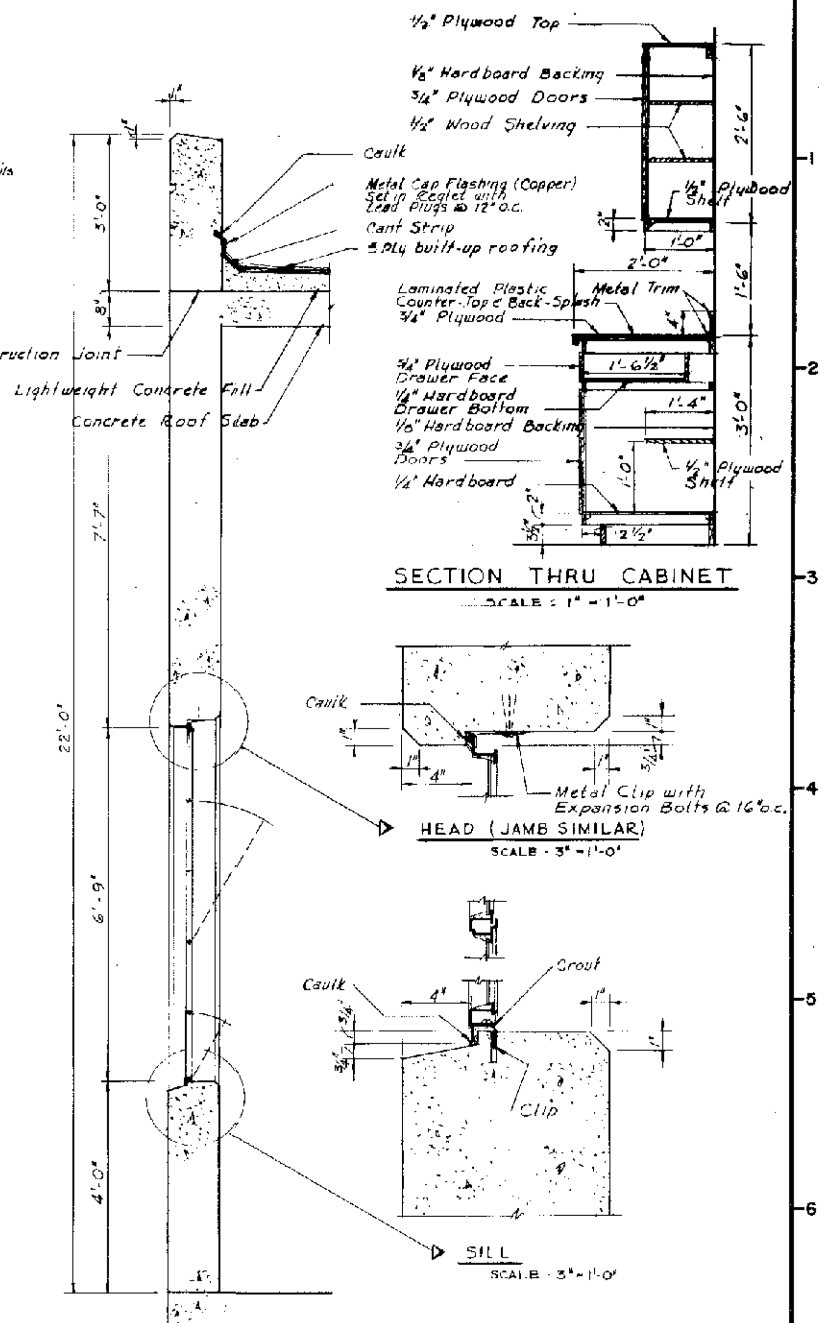
SECTION (A/44)

SCALE - 3/8" = 1'-0"



SECTION (B/44)

SCALE - 3/8" = 1'-0"



SECTION THRU CABINET

SCALE : 1" = 1'-0"

HEAD (JAMB SIMILAR)

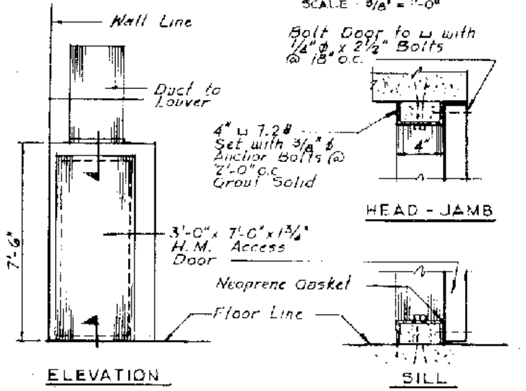
SCALE - 3" = 1'-0"

SILL

SCALE - 3" = 1'-0"

SECTION THRU WINDOW

SCALE - ¾" = 1'-0"


Wall Line
Duct to Louver
Bolt Door to ⊔ with ¼" Ø x 2½" Bolts @ 18" o.c.
4" ⊔ 7.2# Set with ⅜" Ø Anchor Bolts @ 2'-0" o.c. Grout Solid
4"
3'-0" x 7'-0" x 1¾" H.M. Access Door
Neoprene Gasket
Floor Line
7'-6"

HEAD - JAMB

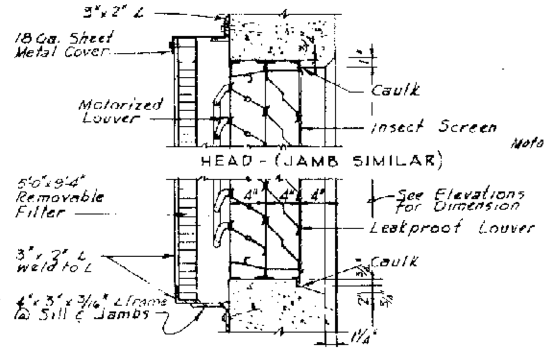
ELEVATION

SCALE - ⅜" = 1'-0"

SILL

SCALE - 3" = 1'-0"

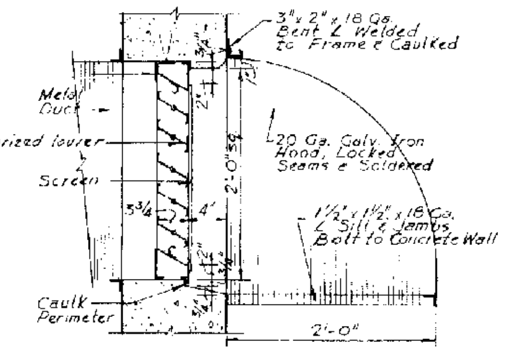
FILTER CHAMBER DETAILS



HEAD - (JAMB SIMILAR)

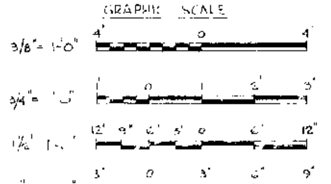
INTAKE LOUVER DETAIL

SCALE: 1½" = 1'-0"


3" x 2" x 18 Ga. Bent ∠ Welded to Frame & Caulked
Metal Duct
Motorized louver
Screen
20 Ga. Galv. Iron Hood, Locked Seams & Soldered
3¾
4"
2'-0"
1½" x 1½" x 18 Ga. ∠ Sill & Jambs Bolt to Concrete Wall
Caulk Perimeter
2'-0"

HOOD & LOUVER DETAIL

SCALE - 1½" = 1'-0"



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J. S. DR. BY W. C. CK. BY

SUBMITTED
CHIEF, ARCH. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DES. BRANCH

APPROVAL RECOMMENDED
CHIEF, P. & R. BRANCH

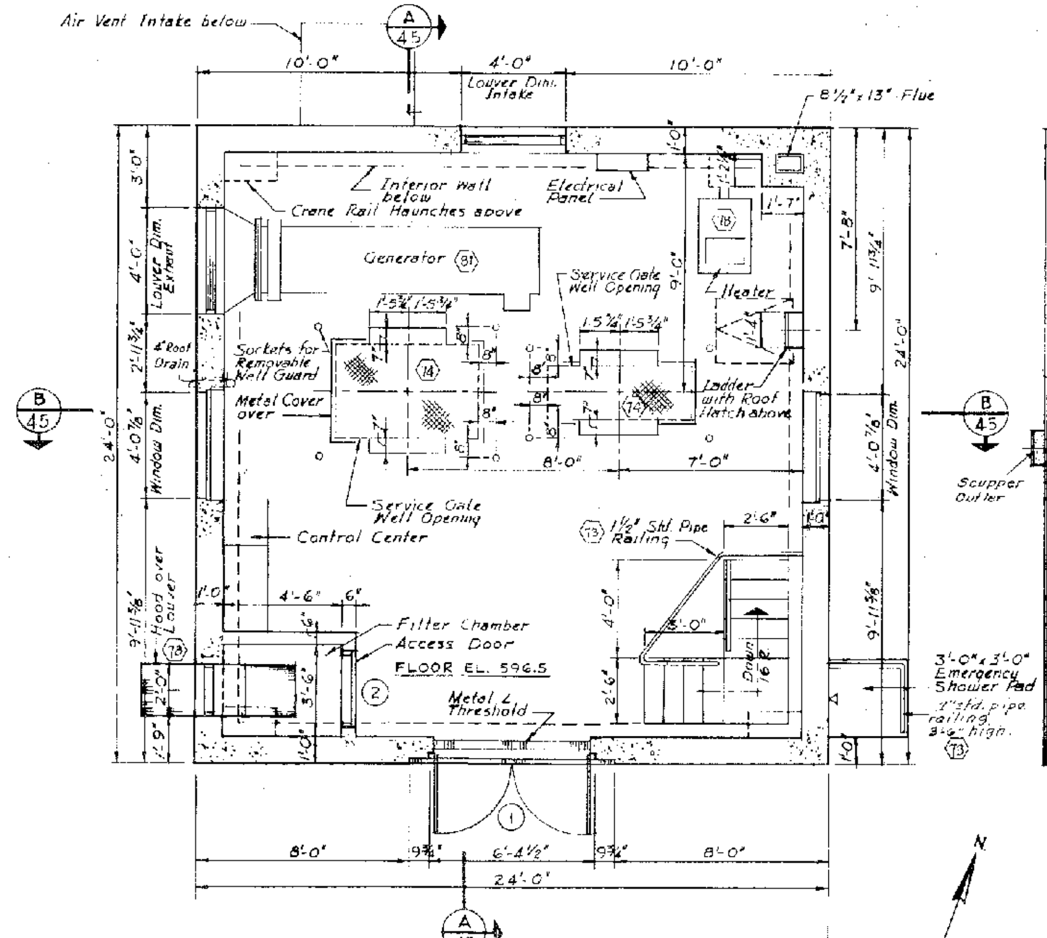
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
ARCHITECTURAL
SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

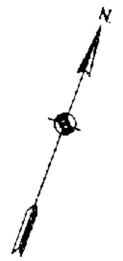
SCALE: 3/8" = 1'-0"
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5751
SHEET 45

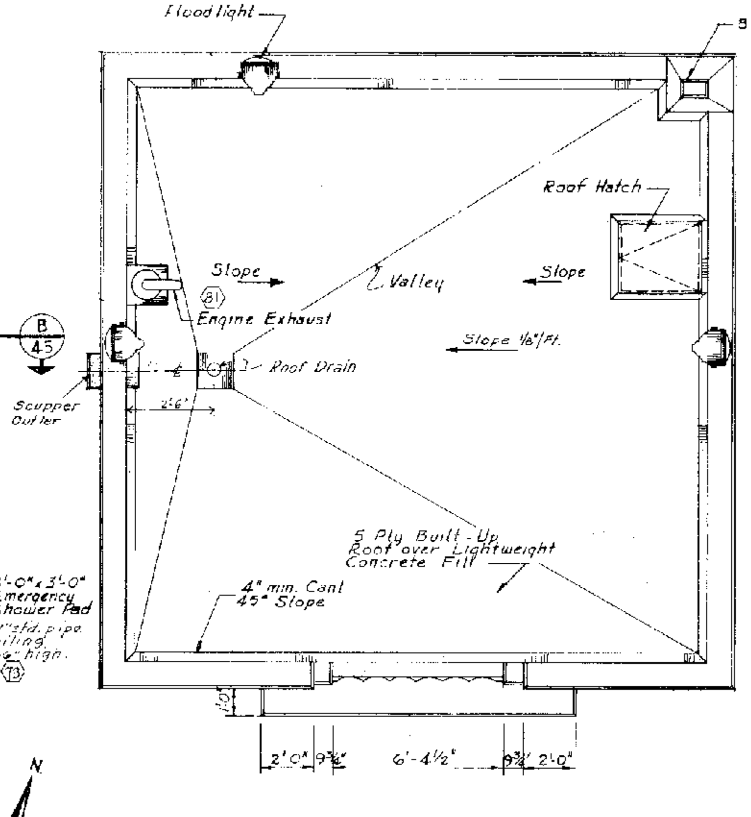
CORPS OF ENGINEERS

U.S. ARMY

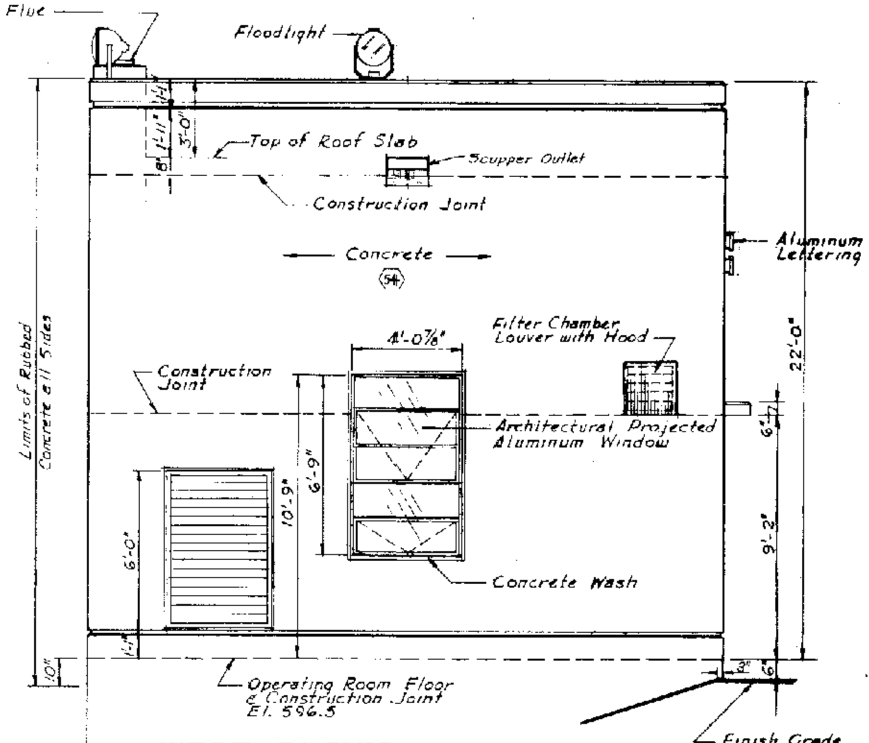


OPERATING ROOM PLAN

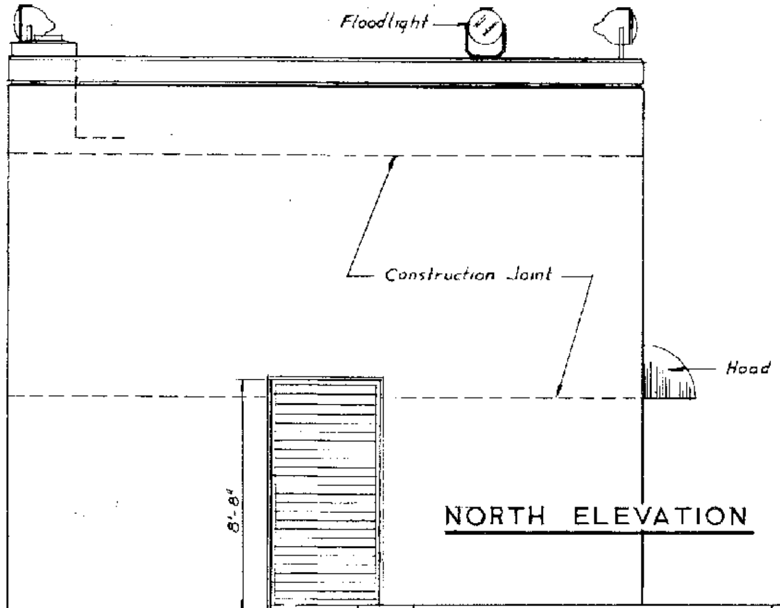




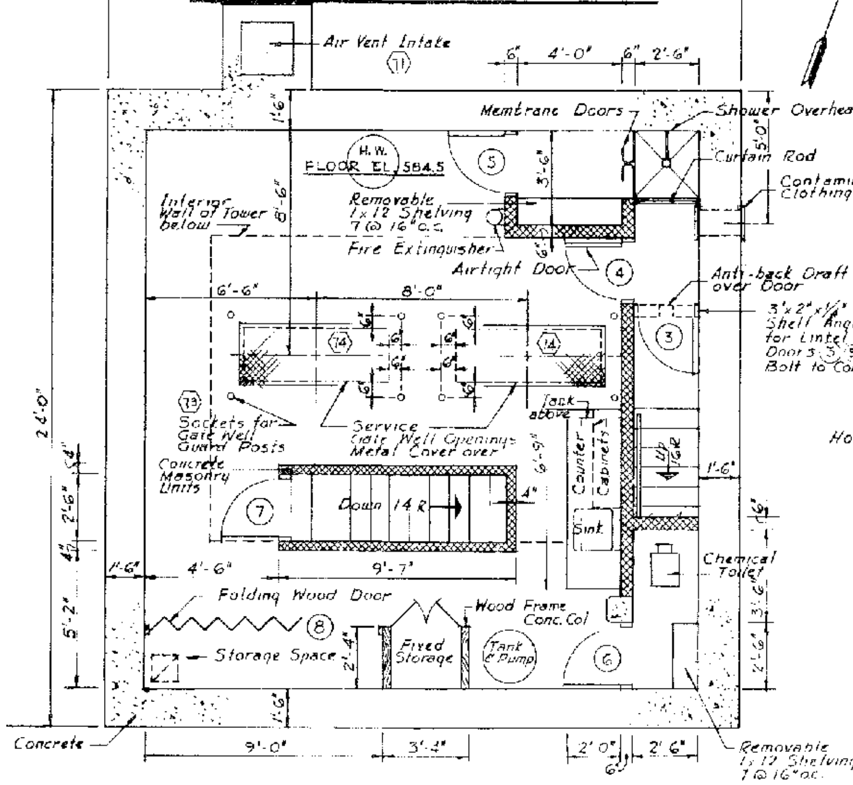
ROOF PLAN



WEST ELEVATION

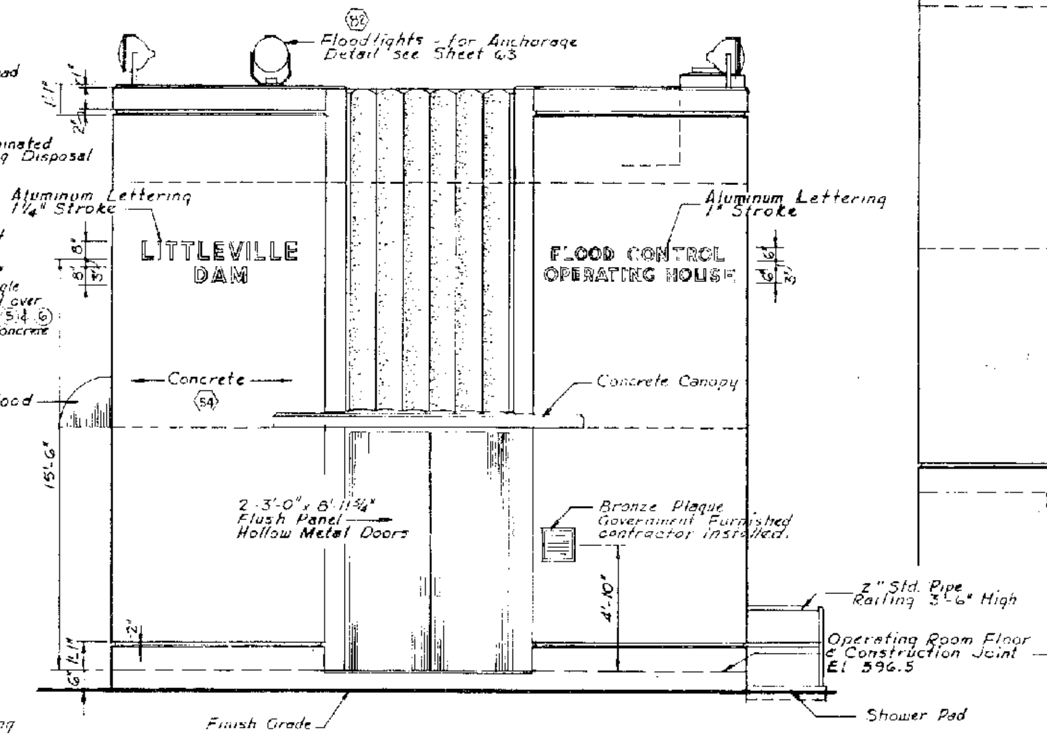


NORTH ELEVATION



BASEMENT FLOOR PLAN

Note: 1. Carry Concrete Masonry Unit Walls to Underside of Concrete Slab
2. All items on this sheet will be paid under item [illegible] unless otherwise noted.


82
Floodlights - for Anchorage Detail see Sheet 63
Aluminum Lettering 1¼" Stroke
LITTLEVILLE DAM
Aluminum Lettering 1" Stroke
FLOOD CONTROL OPERATING HOUSE
Concrete
54
Hood
Concrete Canopy
15'-6"
2-3'-0"x8'-11¾" Flush Panel Hollow Metal Doors
Bronze Plaque Government Furnished contractor installed.
4'-10"
2" Std. Pipe Railing 3'-6" High
Operating Room Floor & Construction Joint El. 596.5
Shower Pad
Finish Grade

SOUTH ELEVATION

GRAPHIC SCALE

3/8" = 1'-0" 4' 0 4'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.C.G. | DR. BY W.C. | CK. BY

SUBMITTED
CHIEF, ARCH. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
ARCHITECTURAL
PLANS AND ELEVATIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

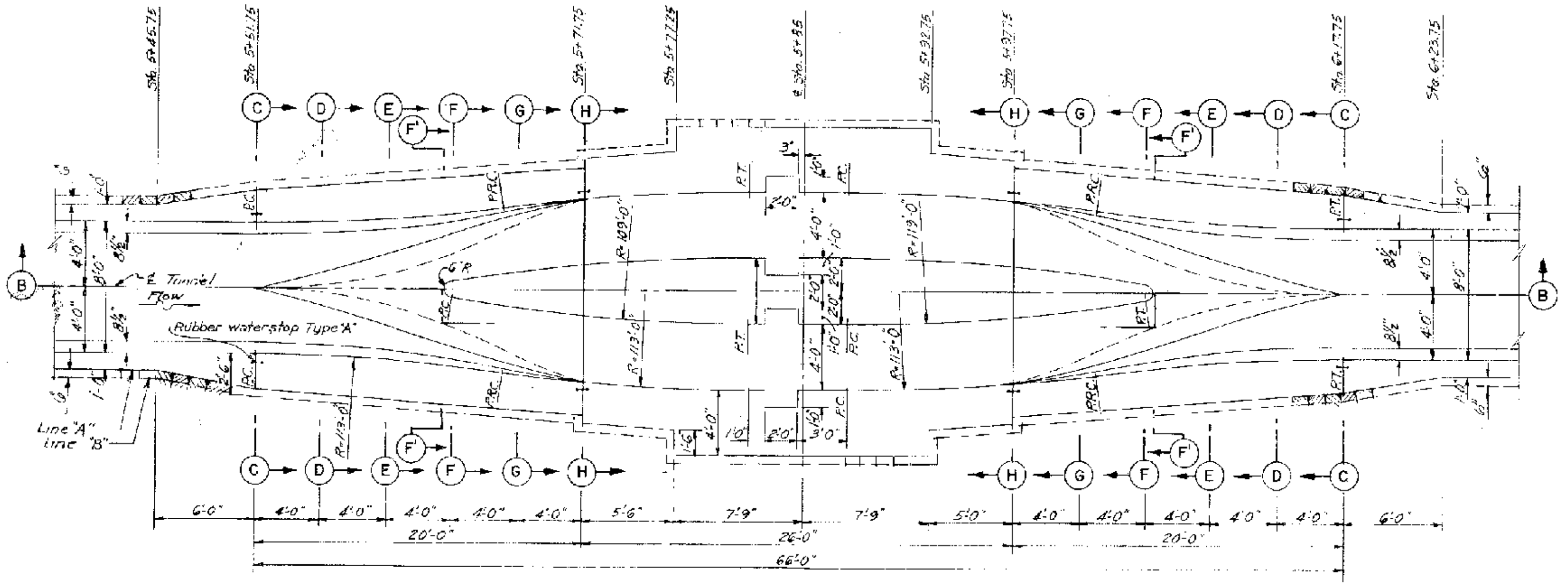
SCALE: 3/8"=1'-0" | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5750

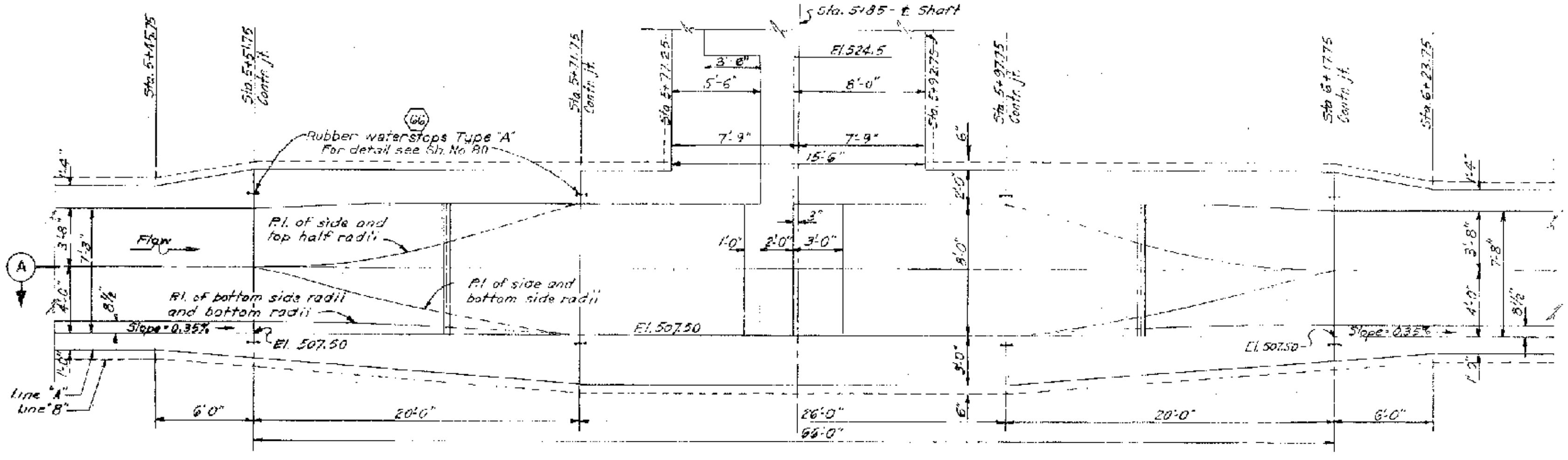
SHEET 44

CORPS OF ENGINEERS

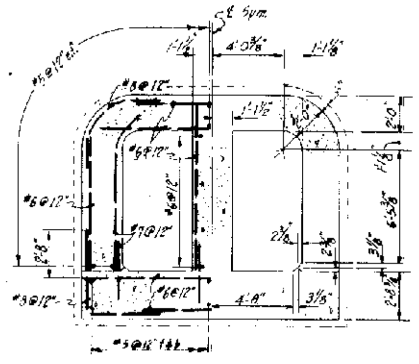
U. S. ARMY



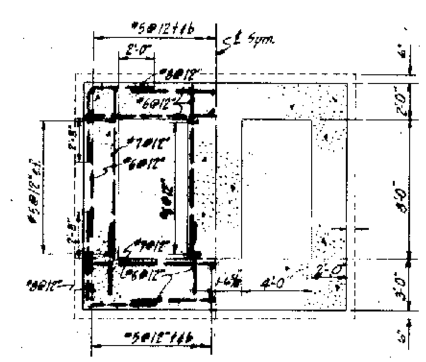
SECTION A-A
SCALE: 1/4"=1'-0"



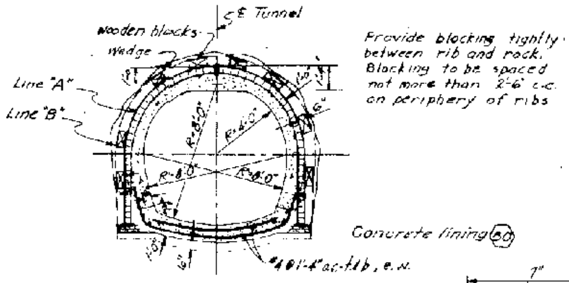
SECTION B-B
SCALE: 1/4"=1'-0"



SECTION G-G
SCALE: 1/4"=1'-0"

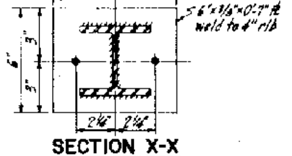


SECTION H-H
SCALE: 1/4"=1'-0"

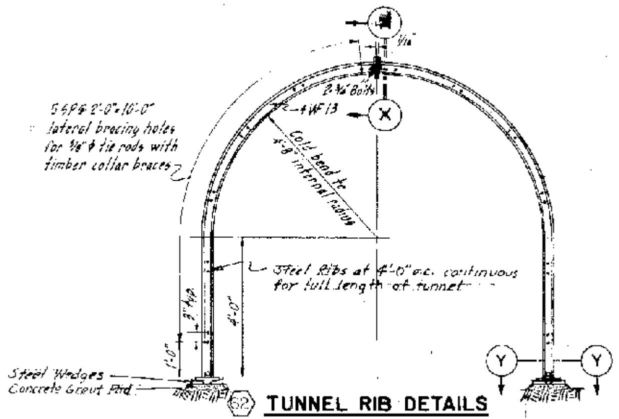


℄ Tunnel
Wooden blocks
Wedge
Line "A"
Line "B"
Provide blocking tightly between rib and rock. Blocking to be spaced not more than 2'-6" c.c. on periphery of ribs
Concrete lining (80)
#4@1'-4" ac. t.&b., e.w.

TYPICAL TUNNEL SECTION
SCALE: 1/4"=1'-0"

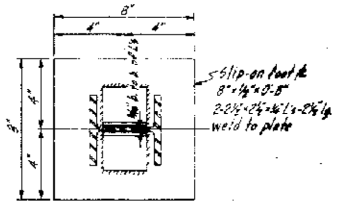


SECTION X-X
SCALE: 3"=1'-0"



5'-6"x2'-0"x10'-0" lateral bracing holes for ⅜" ϕ tie rods with timber collar braces
Cold bend to 8' internal radius
Steel Ribs at 4'-0" c.c. continuous for full length of tunnel
Steel Wedges
Concrete Grout Pad
4"I13
X
Y

TUNNEL RIB DETAILS
SCALE: 1/2"=1'-0"



Slip-on foot ℄ 8"x⅝"x0-8" 2-2½"x2½"x¼"x0'-2¾" ℄ weld to plate

SECTION Y-Y
SCALE: 3"=1'-0"

NOTES

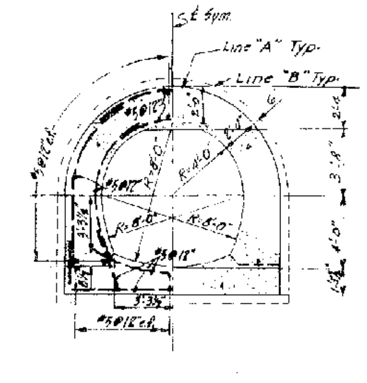
For general notes applying to this sheet, see sheet No. 49

For contraction joint details, see sheet No 80.

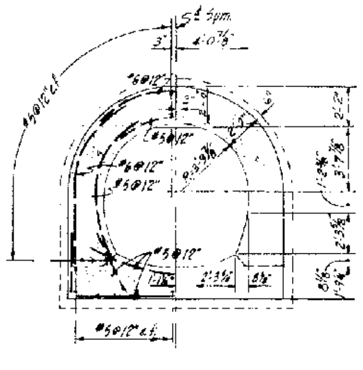
All concrete from Sta. 5+45.75 to 6+23.75 will be paid for under Item No. 51

GRAPHIC SCALES

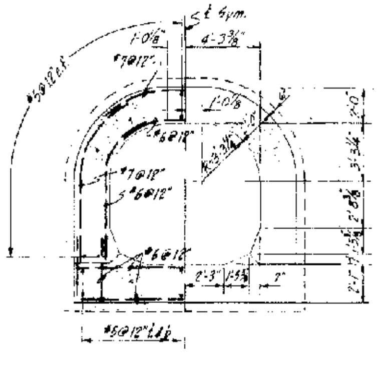
3"=1'-0" 3" 0 3" 6" 9"



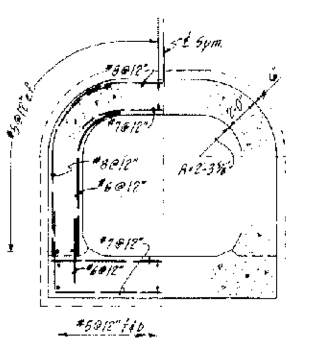
SECTION C-C
SCALE: 1/4"=1'-0"



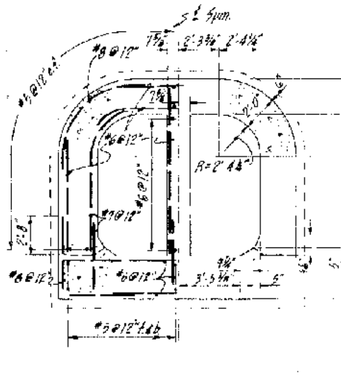
SECTION D-D
SCALE: 1/4"=1'-0"



SECTION E-E
SCALE: 1/4"=1'-0"



SECTION F'-F'
SCALE: 1/4"=1'-0"



SECTION F-F
SCALE: 1/4"=1'-0"

GRAPHIC SCALES

1/4"=1'-0" 4' 0 4' 8'

1/2"=1'-0" 1' 0 1' 2' 3' 4'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
P.H.	K.H.W.	J.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL TUNNEL AND TRANSITION
SECTIONS AND REINFORCING DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

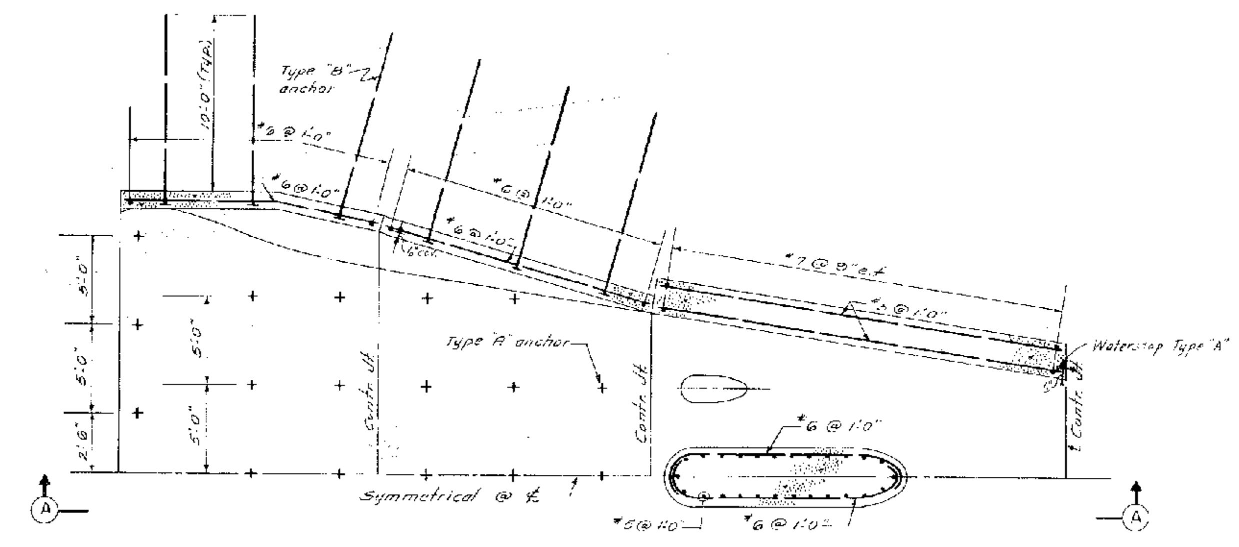
APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

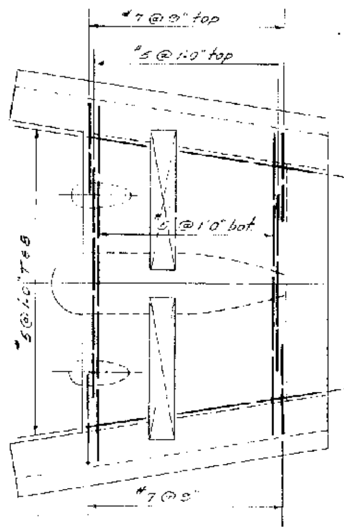
SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5749
SHEET 43

CORPS OF ENGINEERS

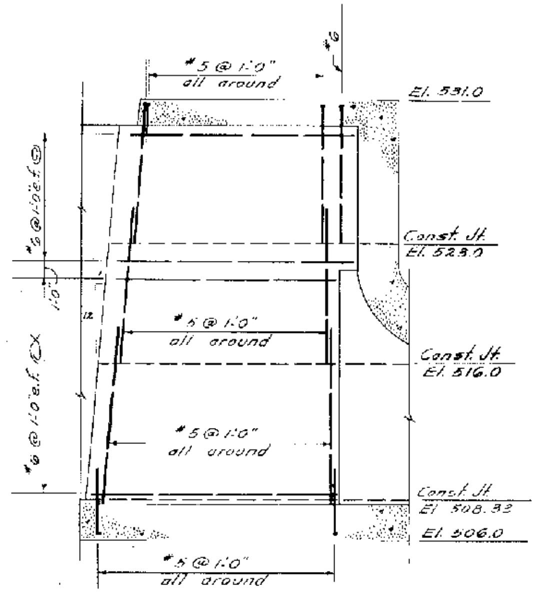
U.S. ARMY



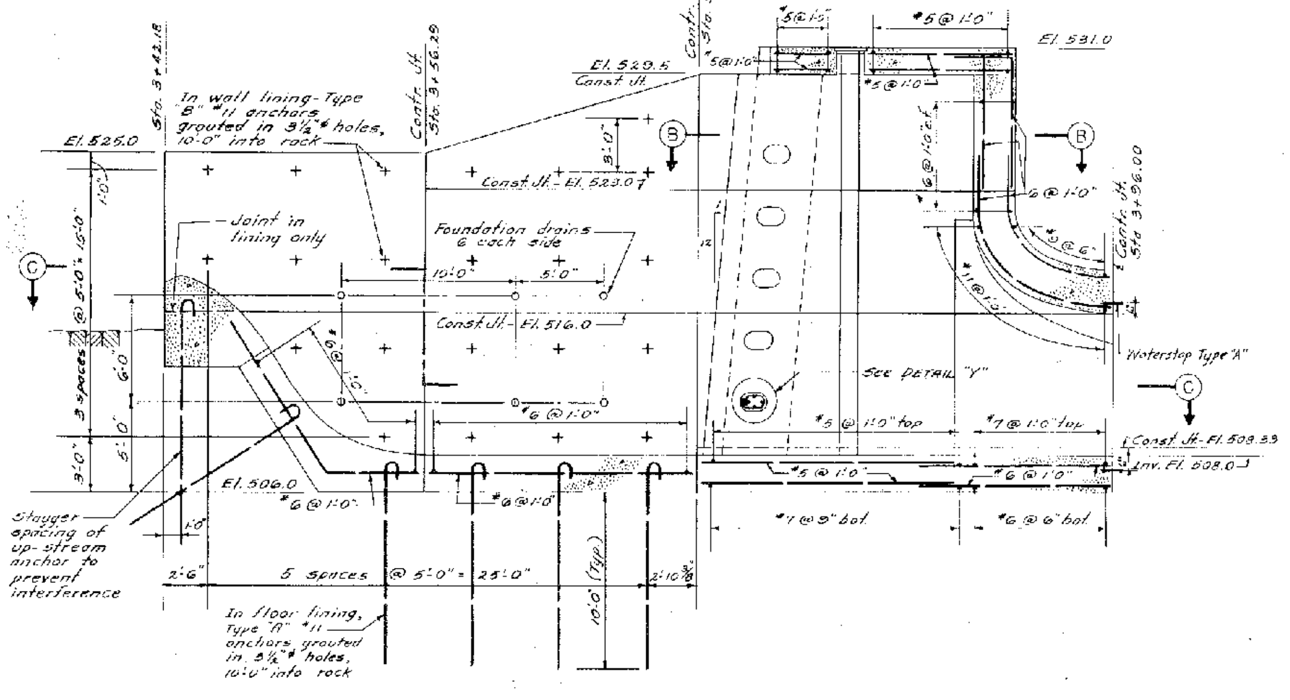
HALF SECTION C-C
SCALE 1/4" = 1'-0"



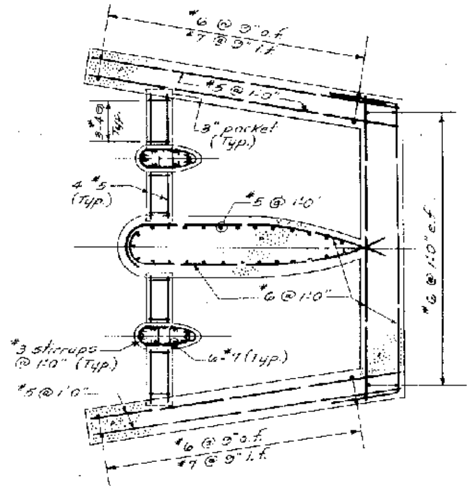
PLAN OF TRASH PLATFORM
SCALE 1/4" = 1'-0"



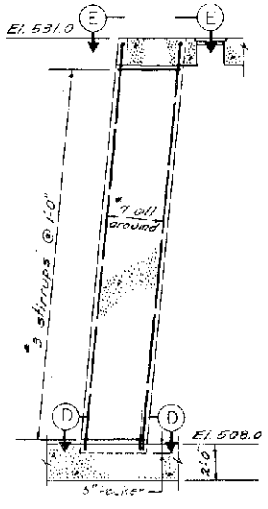
ELEVATION OF CENTER PIER
SCALE 1/4" = 1'-0"



SECTION A-A
SCALE 1/4" = 1'-0"



SECTION B-B
SCALE 1/4" = 1'-0"



TRASH BAR
SCALE 1/4" = 1'-0"

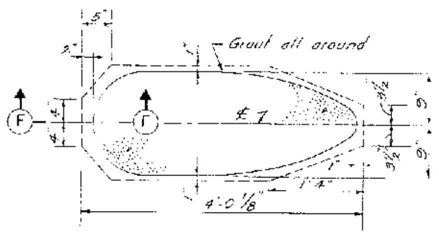
NOTES

For general notes applying to this Sheet except concrete payment item numbers see sheet No. 49.

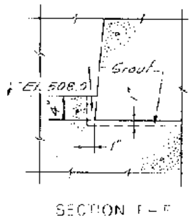
For concrete details pertaining to this sheet see sheet No's. 40 and 41.

Payment for concrete shown on this sheet will be made under Item No. 49.

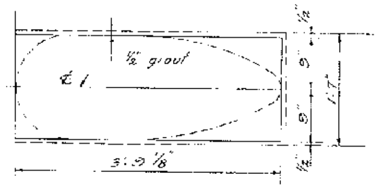
For contraction joint detail see Sheet 80.



SECTION D-D

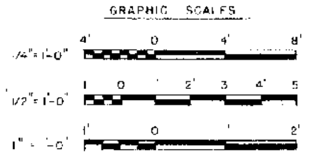


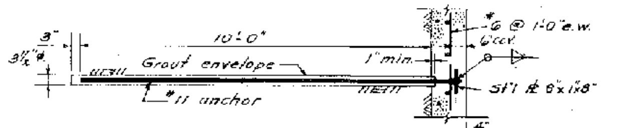
SECTION F-F



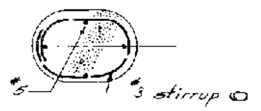
SECTION E-E

TRASH RACK BAR DETAILS
SCALE 1" = 1'-0"

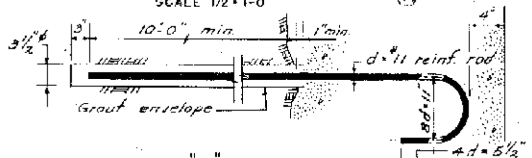




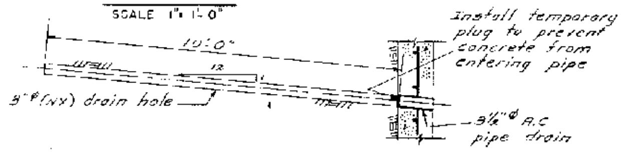
TYPICAL TYPE "B" ANCHOR BAR (44)
SCALE 1/2" = 1'-0"



DETAIL "Y"
SCALE 1" = 1'-0"



TYPICAL TYPE "A" ANCHOR BAR (42)
SCALE 1" = 1'-0"


Install temporary plug to prevent concrete from entering pipe
10'-0"
3"ϕ (AX) drain hole
3½"ϕ R.C. pipe drain

TYPICAL FOUNDATION DRAIN DETAIL (40)
SCALE 1/2" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

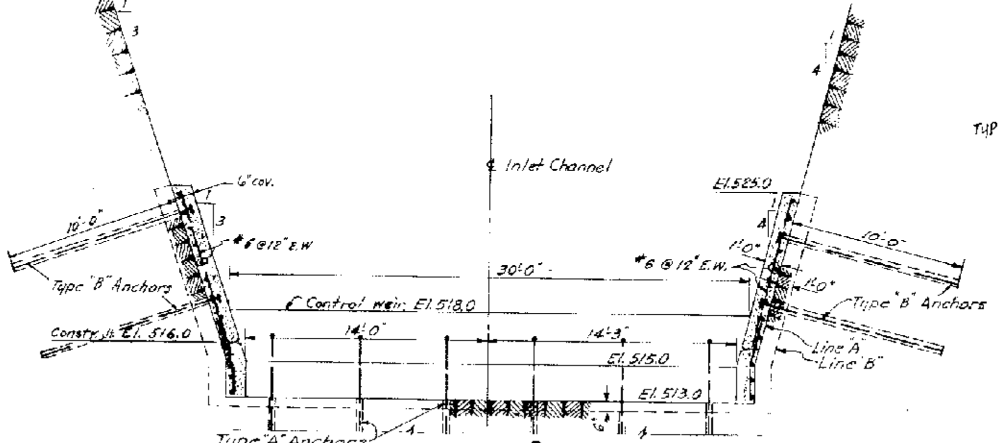
DES. BY	DR. BY	CK. BY
C.M.F.	C.M.A.	

SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

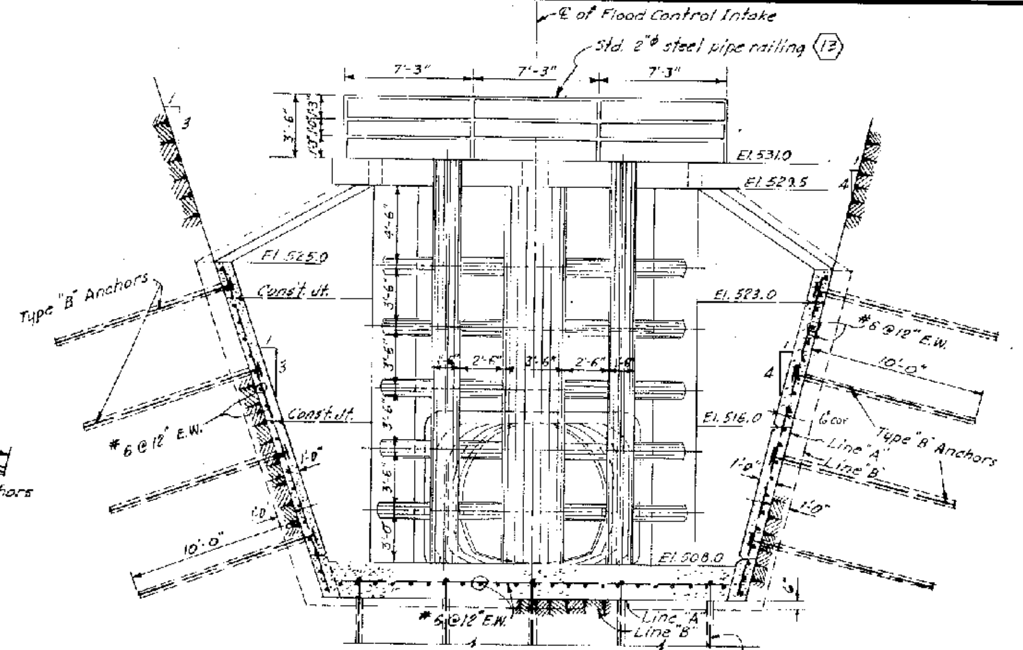
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL INTAKE STRUCTURE
REINFORCING DETAILS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

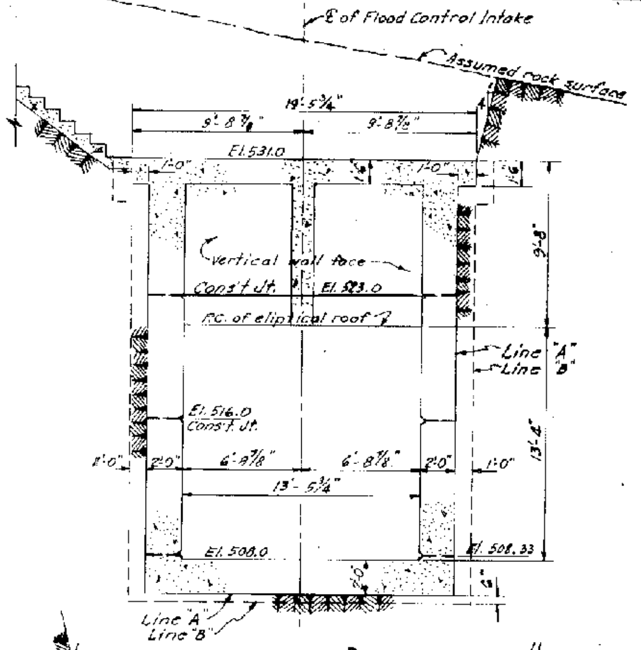
SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5748
SHEET 42



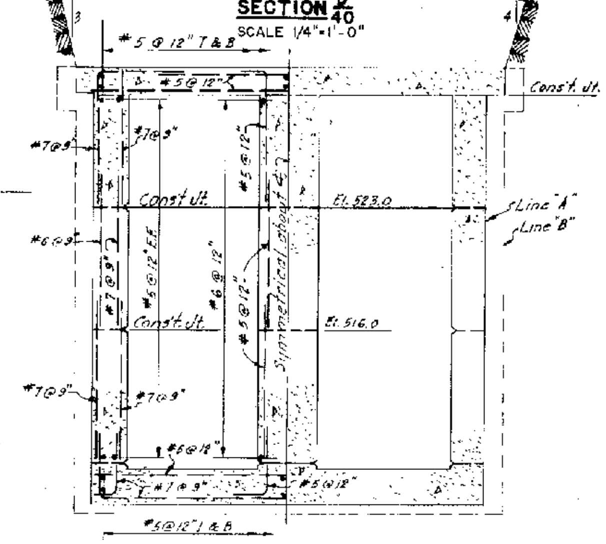
SECTION $\frac{B}{40}$
SCALE 1/4"=1'-0"



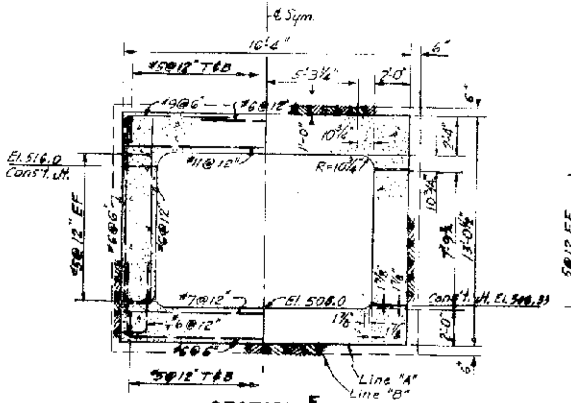
SECTION $\frac{C}{40}$
SCALE 1/4"-1'-0"



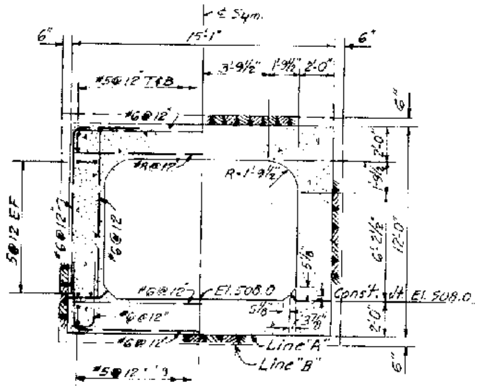
SECTION $\frac{D}{40}$
SCALE 1/4"=1'-0"



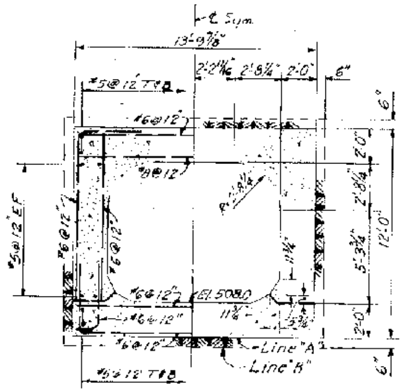
SECTION $\frac{M}{40}$
SCALE 1/4"=1'-0"



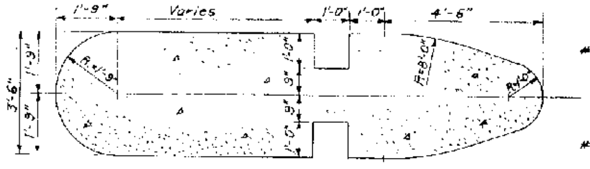
SECTION $\frac{E}{40}$
SCALE 1/4"=1'-0"



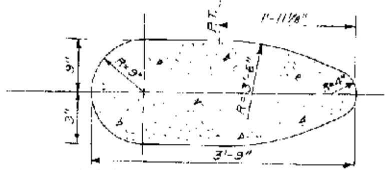
SECTION $\frac{F}{40}$
SCALE 1/4"=1'-0"



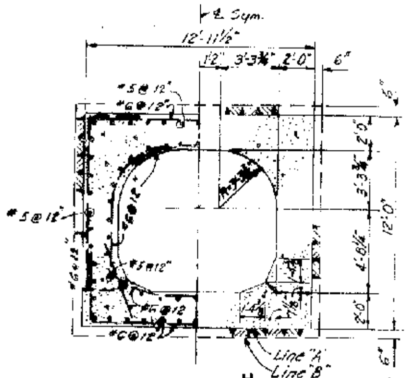
SECTION $\frac{G}{40}$
SCALE 1/4"=1'-0"



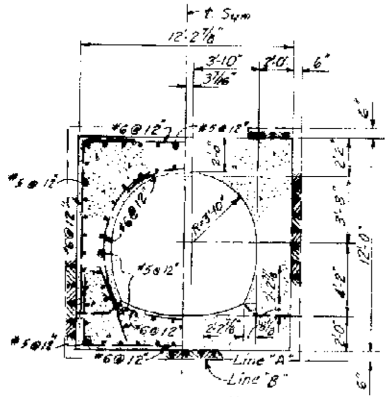
SECTION $\frac{N}{40}$
SCALE: 1/2"=1'-0"



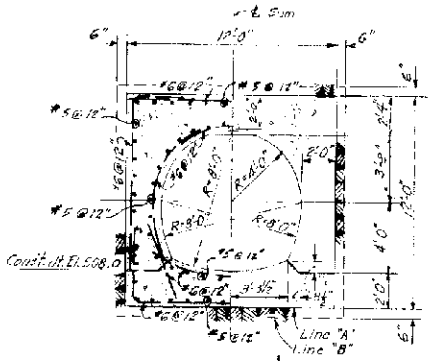
VERTICAL TRASH BAR
SCALE: 1"=1'-0"



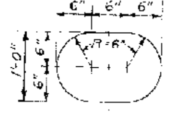
SECTION $\frac{H}{40}$
SCALE 1/4"=1'-0"



SECTION $\frac{K}{40}$
SCALE 1/4"=1'-0"



SECTION $\frac{L}{40}$
SCALE 1/4"=1'-0"



TRASH BAR STRUT
SCALE: 1"=1'-0"

GRAPHIC SCALES

NOTES

For general notes applying to this Sheet see Sheet Nos. 40 & 43
Figures in hexagons indicate item numbers under which payment will be made.
Line "A" indicates minimum thickness of concrete
Line "B" indicates payment line for rock excavation and concrete
All steel reinforcement will be paid for under Item No. 84.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY P.H. DR. BY K.H.W. CK. BY J.H.

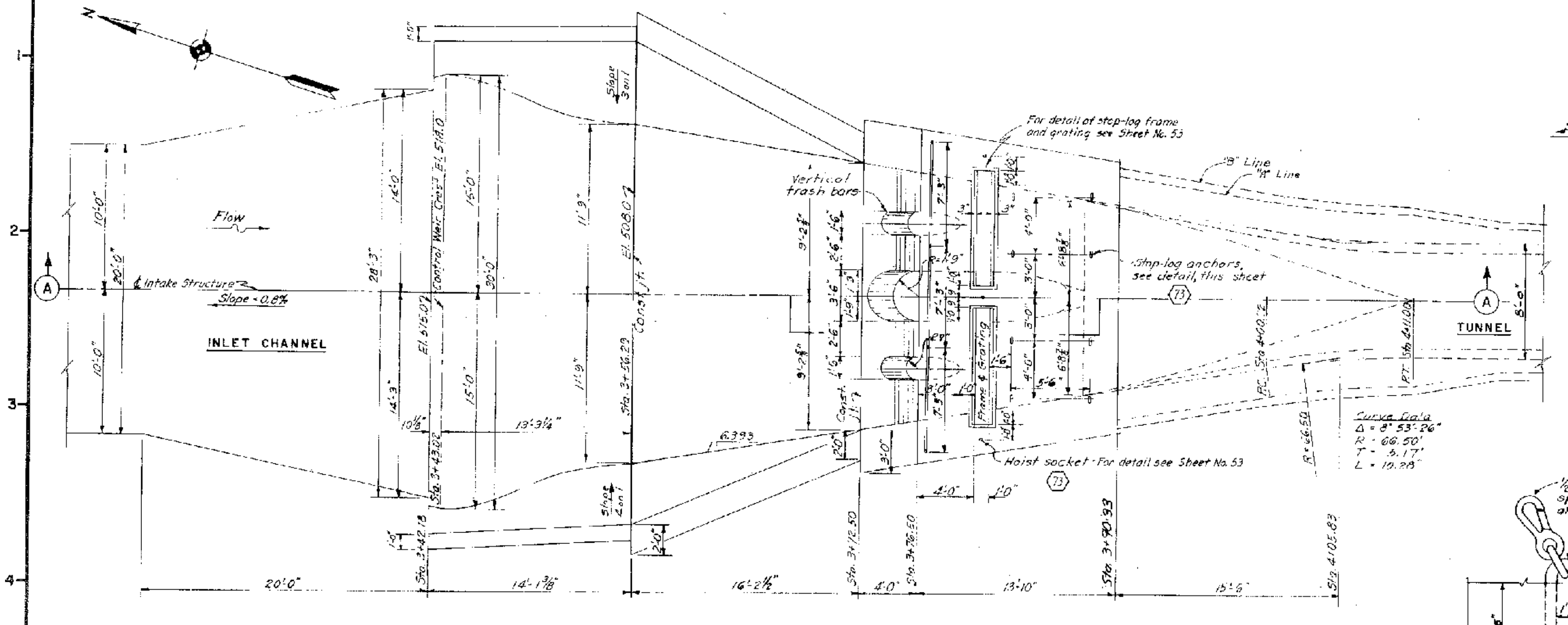
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL INTAKE STRUCTURE
SECTIONS & REINFORCING DETAILS NO. 1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, R. & R. BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

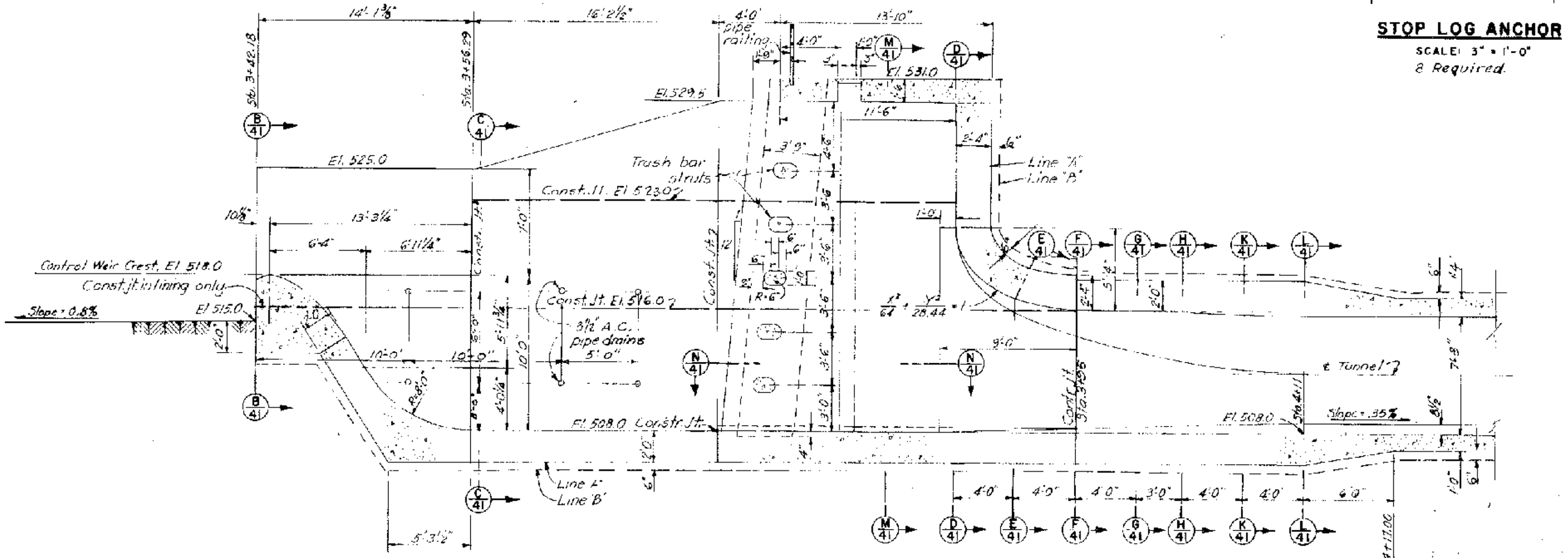
SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5747
SHEET 41

CORPS OF ENGINEERS

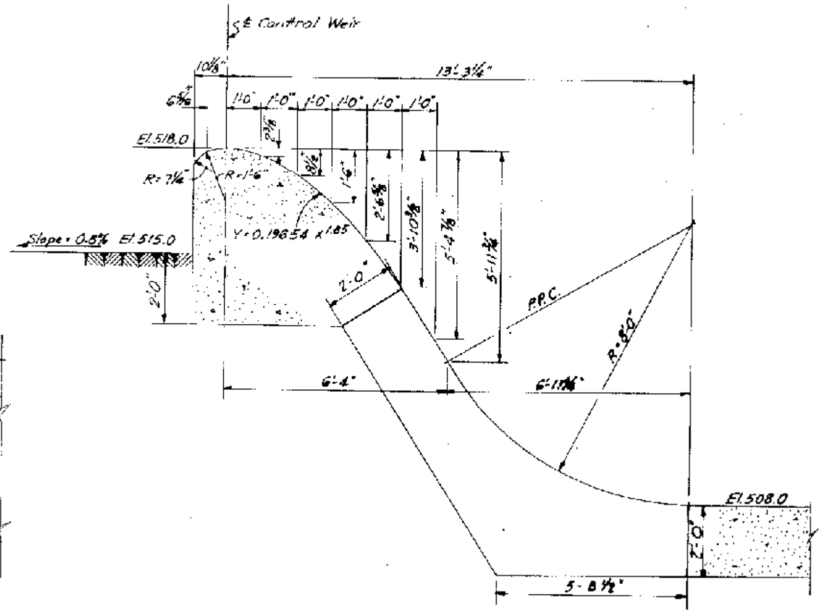
U.S. ARMY



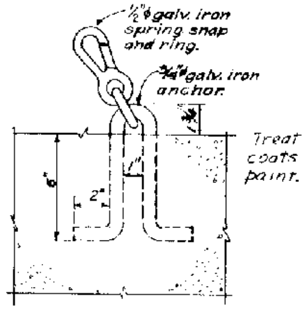
PLAN
SCALE: 1/4" = 1'-0"



SECTION A-A
SCALE: 1/4" = 1'-0"



FLOOD CONTROL WEIR DETAIL
SCALE: 1/2" = 1'-0"


1/2" ϕ galv. iron spring snap and ring.
3/4" ϕ galv. iron anchor.
Treat with two coats bituminous paint.
6"
2"

STOP LOG ANCHOR ⟨73⟩
SCALE: 3" = 1'-0"
2 Required.

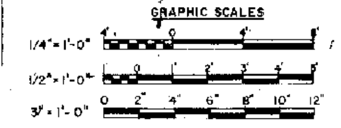
NOTES

Elevations refer to Mean Sea Level Datum.
Figures in hexagons indicate item numbers under which payment will be made.
Line "A" indicates minimum thickness of concrete.
Line "B" indicates payment line for rock excavation and concrete.
All concrete from Sta. 3+42.18 to 3+96 will be paid for under Item No. 49.
All exposed edges of concrete to be formed to 1"-45°
The following details are shown on sheets listed below:

Stuctural Joints	- Sheet No.	34
Type "A" Anchors	- "	42
" "B" "	- "	42
Pipe Railing	- "	74

All concrete from Sta. 3+96 to Sta. 4+17 will be paid for under Item No. 51

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R.H. | DR. BY K.H.W. | CK. BY J.H.

PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL INTAKE STRUCTURE
PLAN SECTION AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVAL RECOMMENDED
CHIEF, BRANCH

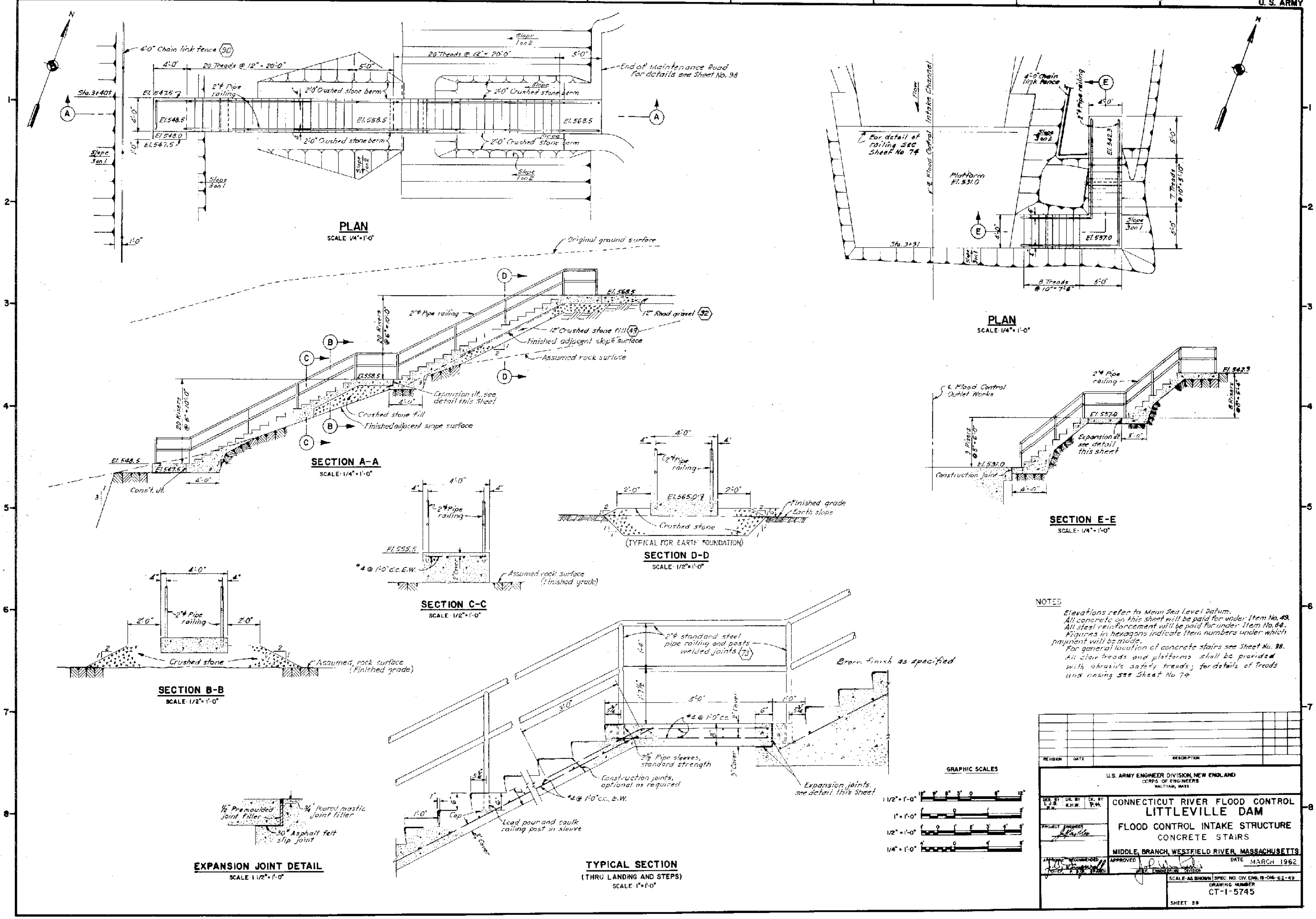
APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-48

DRAWING NUMBER
CT-1-5746

SHEET 40



PLAN
SCALE 1/4" = 1'-0"

SECTION A-A
SCALE 1/4" = 1'-0"

PLAN
SCALE 1/4" = 1'-0"

SECTION E-E
SCALE 1/4" = 1'-0"

SECTION D-D
SCALE 1/2" = 1'-0"

SECTION C-C
SCALE 1/2" = 1'-0"

SECTION B-B
SCALE 1/2" = 1'-0"

EXPANSION JOINT DETAIL
SCALE 1 1/2" = 1'-0"

TYPICAL SECTION
(THRU LANDING AND STEPS)
SCALE 1" = 1'-0"

NOTES

Elevations refer to Mean Sea Level Datum.
All concrete on this sheet will be paid for under Item No. 49.
All steel reinforcement will be paid for under Item No. 64.
Figures in hexagons indicate Item numbers under which payment will be made.
For general location of concrete stairs see Sheet No. 38.
All stair treads and platforms shall be provided with abrasive safety treads; for details of treads and nosing see Sheet No 74

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY L.J.B. R.H. | DR. BY K.H.W. | CK. BY P.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

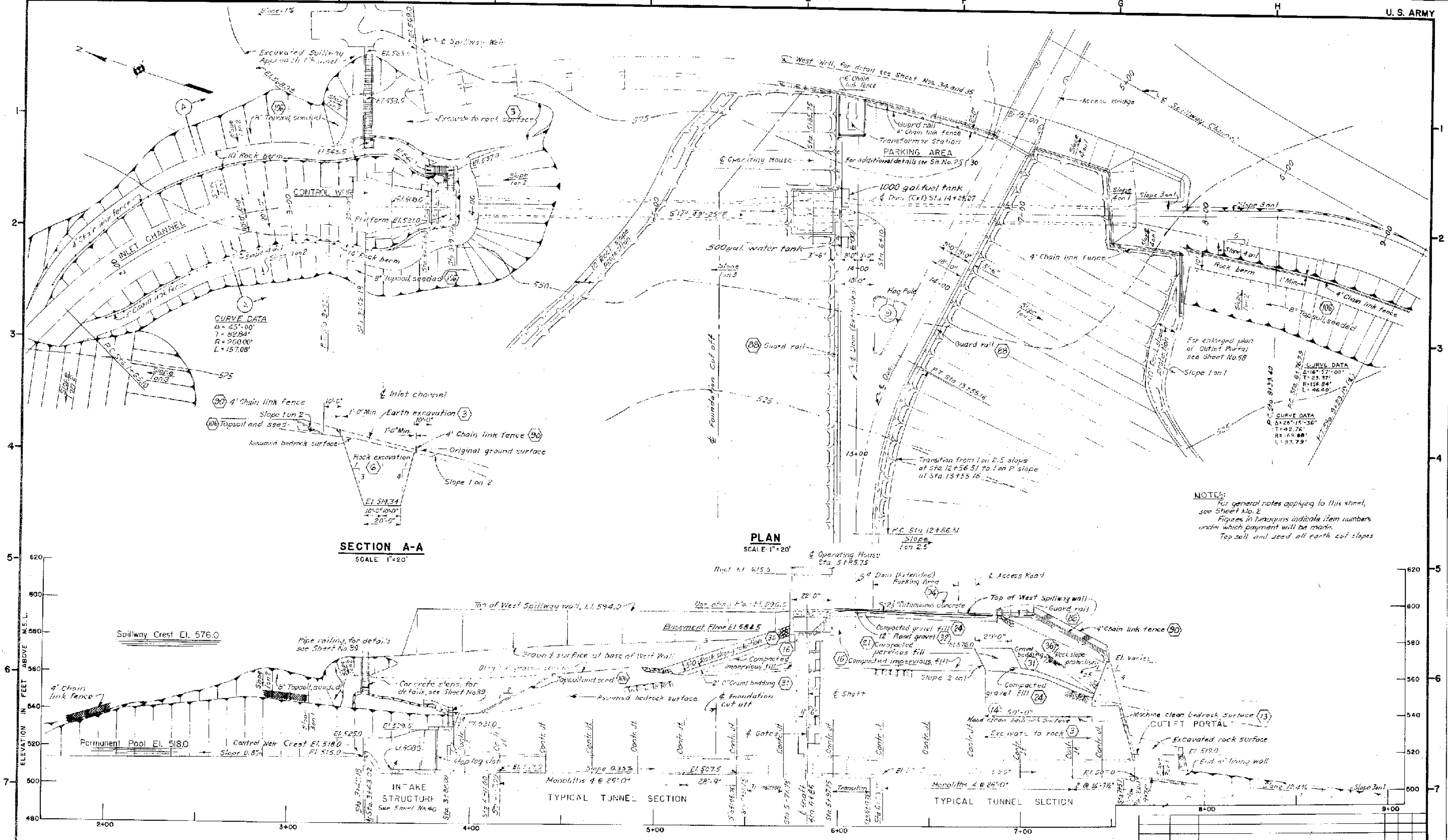
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL INTAKE STRUCTURE
CONCRETE STAIRS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5745
SHEET 39

CORPS OF ENGINEERS

U. S. ARMY



NOTES:

For general notes applying to this sheet, see Sheet No. 2

Figures in hexagons indicate item numbers under which payment will be made.

Top soil and seed all earth cut slopes

SECTION A-A
SCALE: 1" = 20'

PLAN
SCALE: 1" = 20'

PROFILE ALONG ℄
SCALE: 1" = 20'

GRAPHIC SCALE
1" = 20'
20' 0 20' 40'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.J.B. K.H.W.
DR. BY K.H.W.
CK. BY P.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL OUTLET WORKS
PLAN AND PROFILE
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

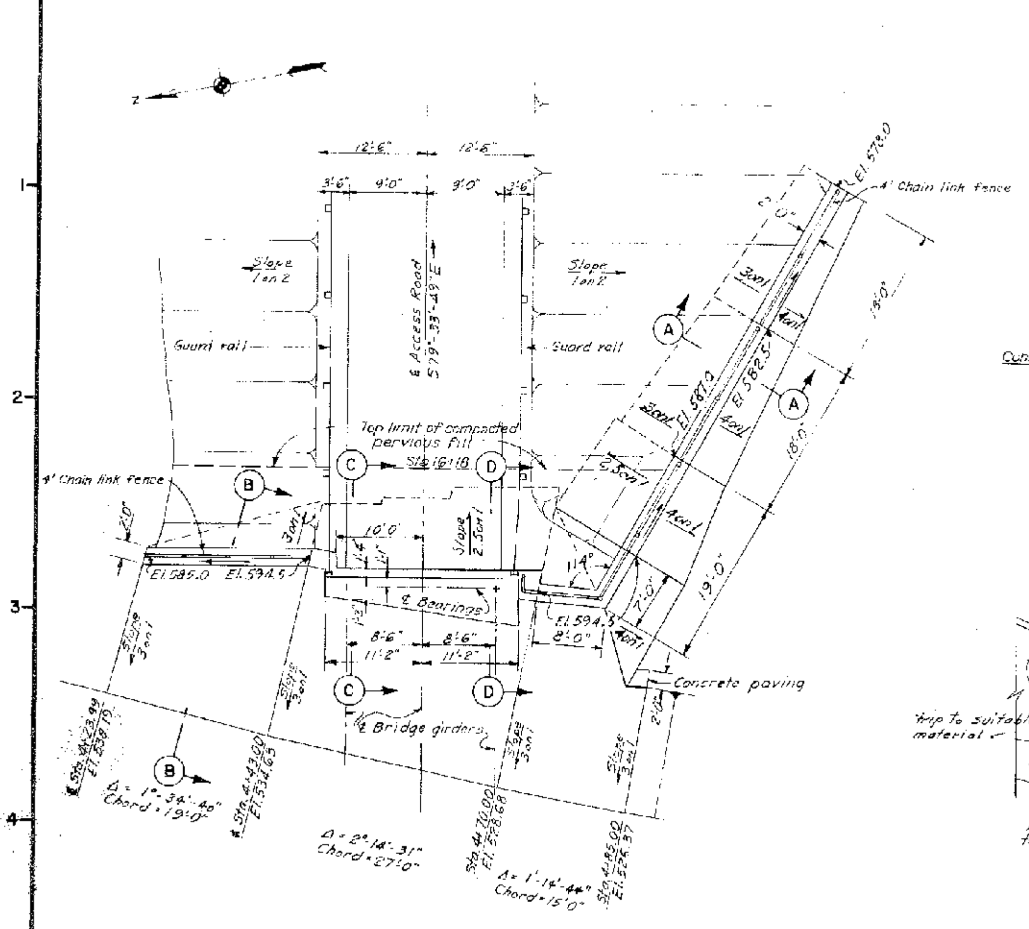
APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

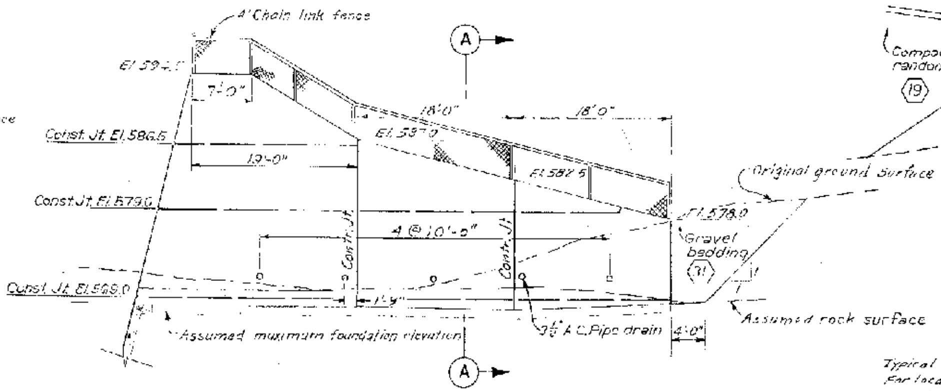
SCALE: 1" = 20'
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5744
SHEET 39

CORPS OF ENGINEERS

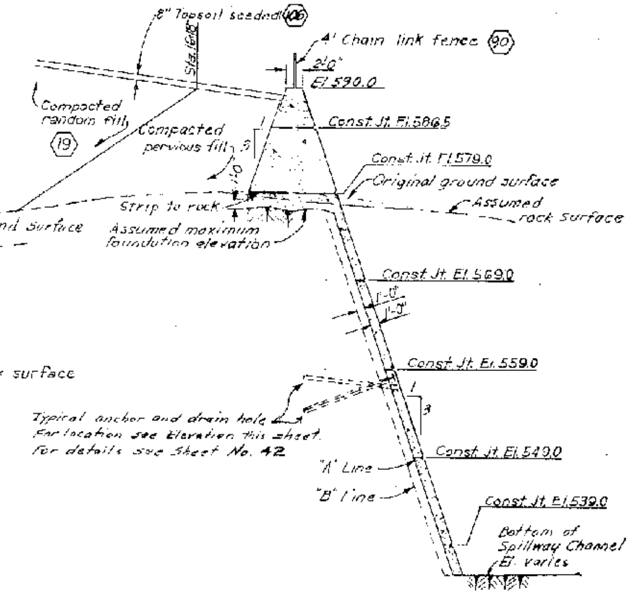
U. S. ARMY



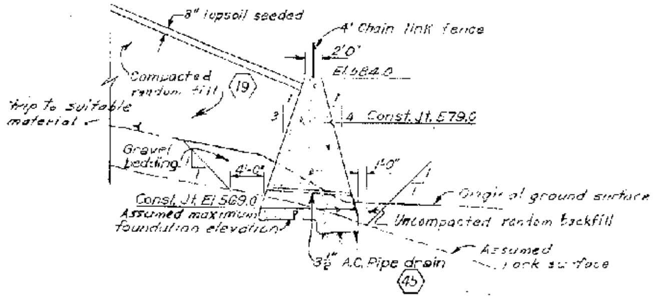
PLAN
SCALE 1/8"=1'-0"



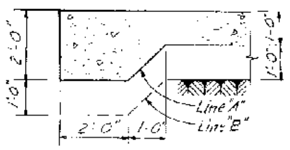
ELEVATION - SOUTH WING WALL
SCALE 1/8"=1'-0"



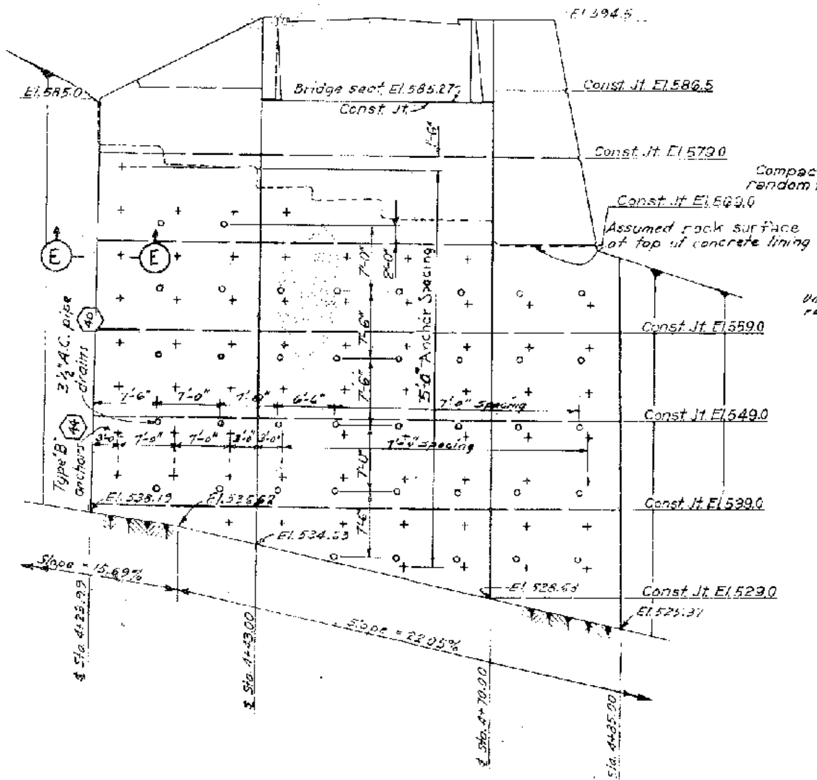
SECTION B-B
SCALE 1/8"=1'-0"



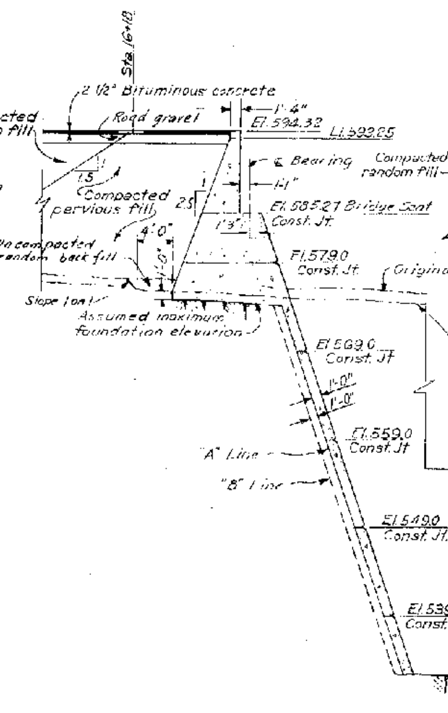
SECTION A-A
SCALE 1/8"=1'-0"



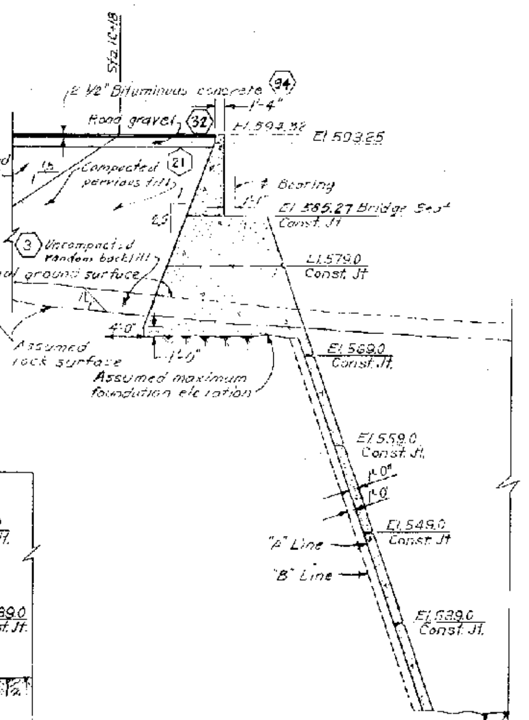
SECTION E-E
SCALE 1/2"=1'-0"



ELEVATION
SCALE 1/8"=1'-0"



SECTION C-C
SCALE 1/8"=1'-0"



SECTION D-D
SCALE 1/8"=1'-0"

NOTES

For general notes applying to this sheet, see Sheet No. 31 & 35
Figures in hexagons indicate item numbers under which payment will be made.
Line "A" indicates the minimum thickness of concrete.
Line "B" indicates the payment line for rock excavation and concrete.
All concrete lining to be reinforced with #6 bars, 12" c.c., both ways. For detail see Sheet No. 34
Concrete in Retaining Walls will be paid for under Item No. 45
Concrete in Bridge Abutment will be paid for under Item No. 48
Concrete in lining will be paid for under Item No. 46.
Compacted pervious fill adjacent to the back of the wall shall extend from Sta. 4+24 to intersection with south wing wall.
Gravel bedding to be placed along entire length of south wing wall.

GRAPHIC SCALE
1/8"=1'-0" 0 4' 8' 12' 16' 20'
1/2"=1'-0" 0 1' 2' 3' 4' 5'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B.	K.H.W.	P.H.

PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY-EAST RETAINING WALL
PLAN, ELEVATIONS AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVAL RECOMMENDED
CHIEF, BRANCH

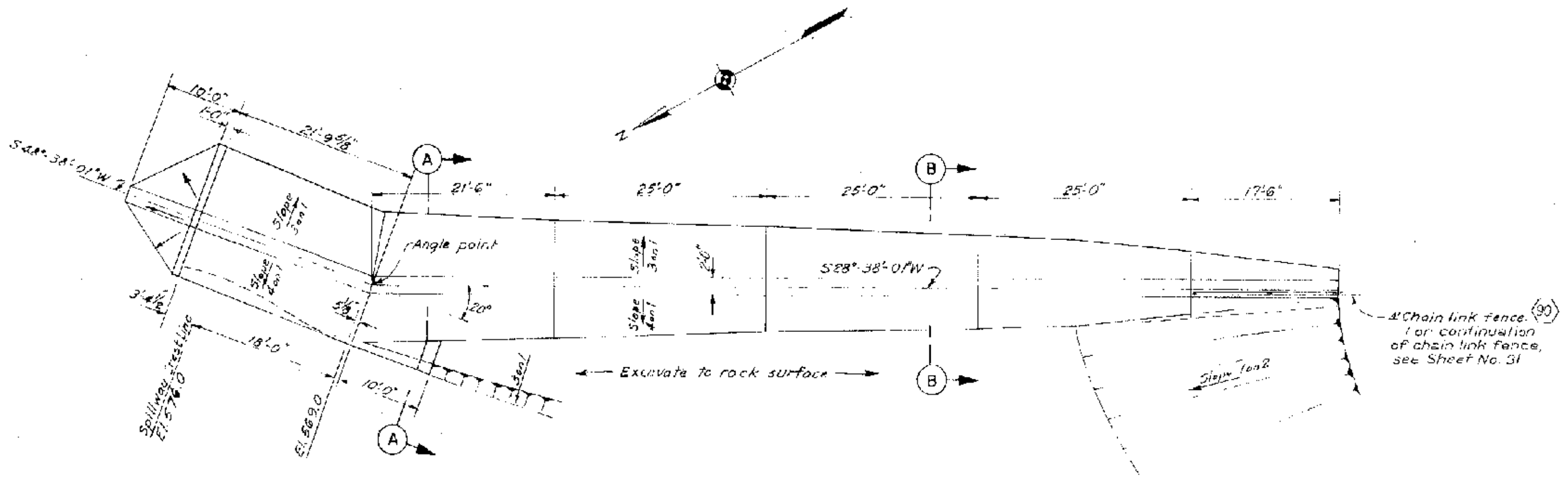
APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5743
SHEET 37

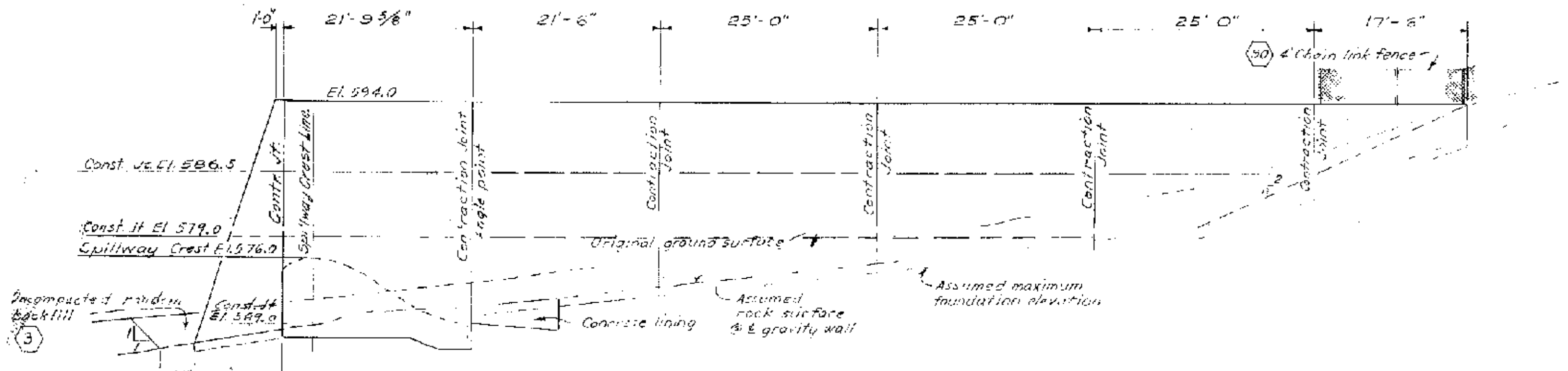
CORPS OF ENGINEERS

U. S. ARMY



PLAN

SCALE - 1/8" = 1'-0"



ELEVATION

SCALE 1/8" = 1'-0"

NOTES-

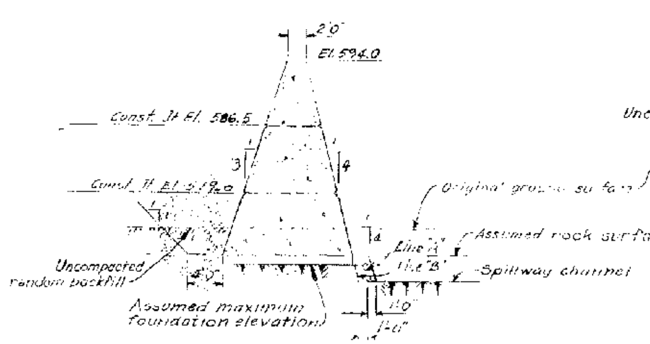
For general notes applying to this sheet, see Sheets No. 31 and 34.

Figures in hexagons indicate item numbers under which payment will be made.

Line "A" indicates the minimum thickness of concrete.

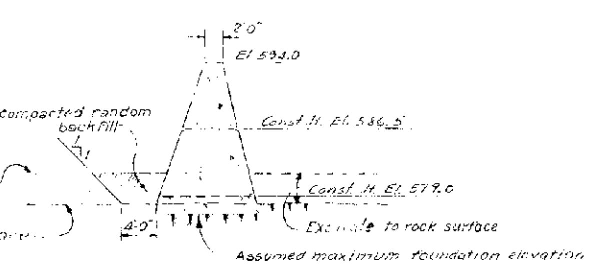
Line "B" indicates the payment line for rock excavation and concrete.

All concrete on this sheet will be paid for under Item No. 45.



SECTION A-A

SCALE 1/8" = 1'-0"



SECTION B-B

SCALE 1/8" = 1'-0"

GRAPHIC SCALE

1/8" = 1'-0" 4' 0 4' 8' 12' 16' 20'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B.	K.H.W.	P.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY-EAST WALL
PLAN, ELEVATION AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

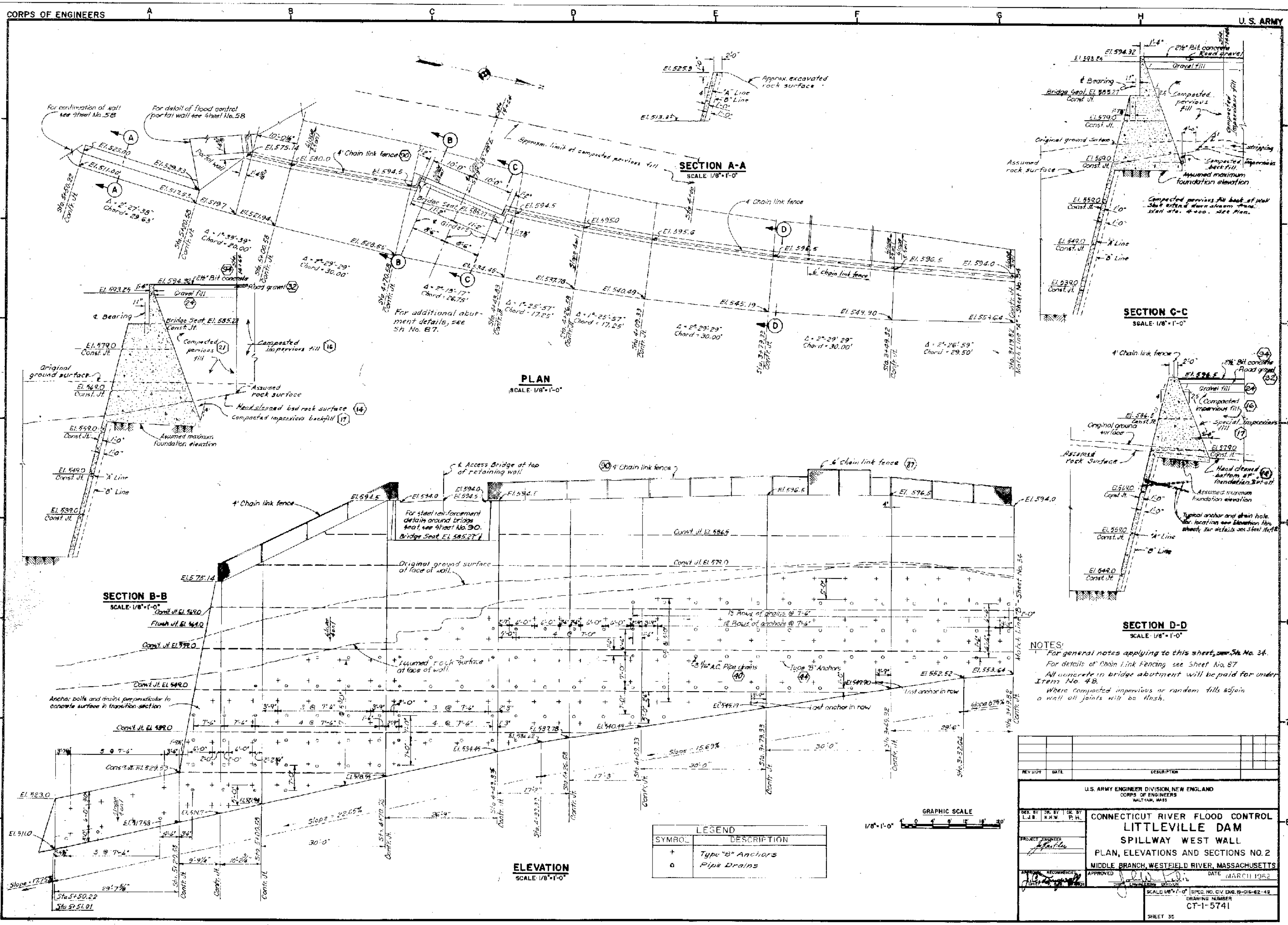
DATE MARCH 1962

SCALE

SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5742

SHEET 36


CORPS OF ENGINEERS
U.S. ARMY
SECTION A-A
SCALE 1/8" = 1'-0"
PLAN
SCALE 1/8" = 1'-0"
SECTION B-B
SCALE 1/8" = 1'-0"
SECTION C-C
SCALE 1/8" = 1'-0"
SECTION D-D
SCALE 1/8" = 1'-0"
ELEVATION
SCALE 1/8" = 1'-0"
For continuation of wall see Sheet No. 58
For detail of flood control portal wall see Sheet No. 58
Approx. limit of compacted pervious fill
4' Chain link fence
6' Chain link fence
For additional abutment details, see Sh. No. 87.
Bridge Seat El. 585.27
Compacted pervious fill
Compacted impervious fill
Assumed rock surface
Hand cleaned bed rock surface
Compacted impervious backfill
Assumed maximum foundation elevation
Original ground surface
"A" Line
"B" Line
Gravel fill
2½" Bit. concrete
Road gravel
Approx. excavated rock surface
℄ Access Bridge at top of retaining wall
For steel reinforcement details around bridge seat, see Sheet No. 30.
Original ground surface at face of wall.
Assumed rock surface at face of wall
Anchor bolts and drains perpendicular to concrete surface in transition section
15 Rows of drains @ 7'-6"
12 Rows of anchors @ 7'-6"
3 ½" A.C. Pipe drains
Type "B" Anchors
Last anchor in row
Match Line "A" - Sheet No. 34
Match Line "B" - Sheet No. 34
Typical anchor and drain hole. For location see Elevation this sheet. For details see Sheet No. 48
Compacted pervious fill back of wall shall extend down stream from Stat. Sta. 4+00. See Plan.
A B C D E F G H
1 2 3 4 5 6 7 8

NOTES:

For general notes applying to this sheet, see Sh. No. 34.

For details of Chain Link Fencing see Sheet No. 87

All concrete in bridge abutment will be paid for under Item No. 48.

Where compacted impervious or random fills adjoin a wall all joints will be flush.

LEGEND	
SYMBOL	DESCRIPTION
+	Type "B" Anchors
o	Pipe Drains

GRAPHIC SCALE
1/8" = 1'-0" 4' 0 4' 8' 12' 16' 20'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY L.J.B. | DR. BY K.H.W. | CK. BY P.H.

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY WEST WALL
PLAN, ELEVATIONS AND SECTIONS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

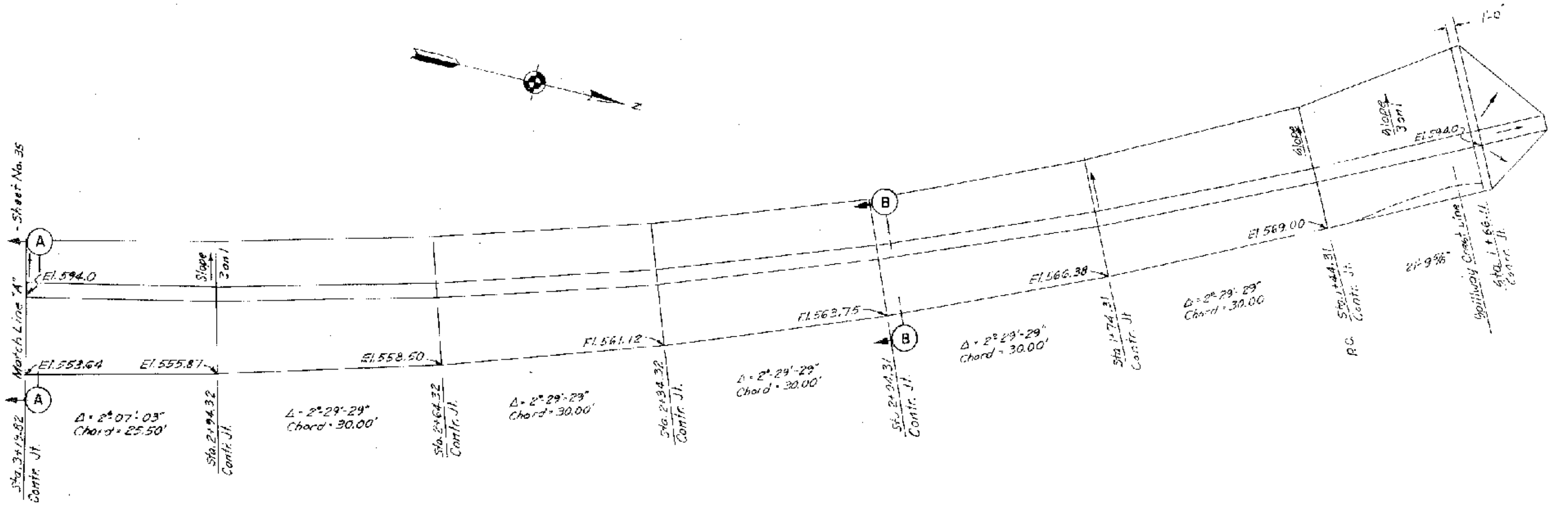
PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, ... BR. BRANCH

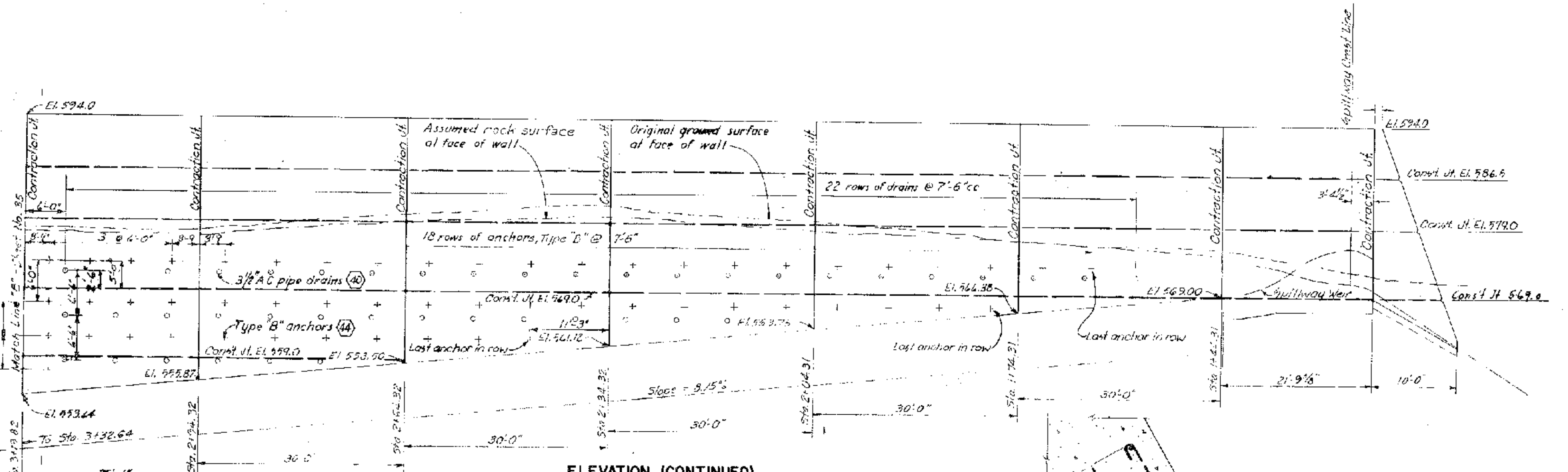
APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

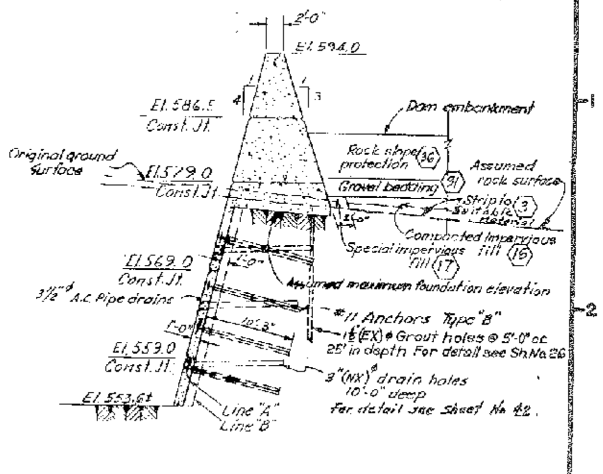
SCALE 1/8" = 1'-0"
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5741
SHEET 35



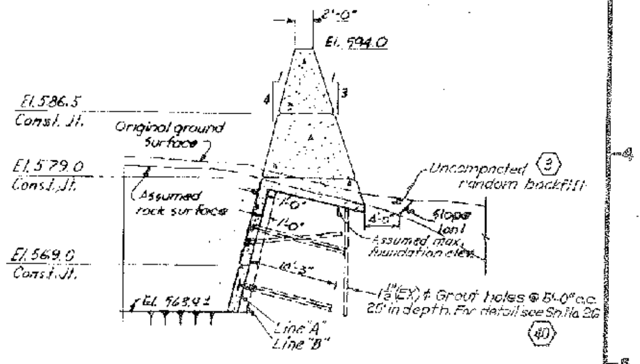
PLAN (CONTINUED)
SCALE: 1/8" = 1'-0"



ELEVATION (CONTINUED)
SCALE 1/8" = 1'-0"


2'-0"
El. 594.0
El. 586.5 Const. Jt.
Dam embankment
Original ground surface
El. 579.0 Const. Jt.
Rock slope protection (36)
Gravel bedding (91)
Assumed rock surface
Strip to suitable material (3)
Compacted impervious fill (16)
Special impervious fill (17)
El. 569.0 Const. Jt.
Assumed maximum foundation elevation
3½" A.C. Pipe drains
#11 Anchors Type "B"
1½"(EX) ⌀ Grout holes @ 5'-0" cc 25' in depth. For detail see Sh. No. 26
El. 559.0 Const. Jt.
3"(NX) ⌀ drain holes 10'-0" deep For detail see Sheet No. 42.
El. 553.6±
Line "A"
Line "B"
10'-3"
1'-0"

SECTION A-A
SCALE: 1/8" = 1'-0"



SECTION B-B
SCALE 1/8" = 1'-0"

NOTES

Figures in hexagons denote item numbers under which payment will be made.

All concrete in Retaining Walls will be paid for under Item No. 45.

All concrete in Channel Lining will be paid for under Item No. 46.

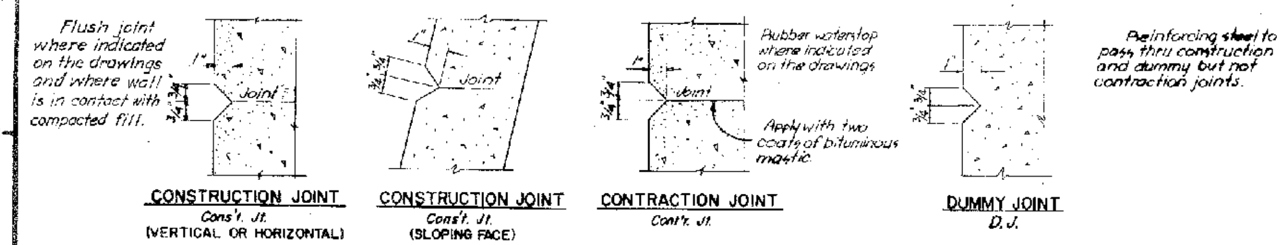
For details of Structural Joints see this Sheet.

For details of Chain Link Fencing see Sheet No. 87.

Line "A" indicates the minimum thickness of concrete.

Line "B" indicates the payment line for rock excavation and concrete.

All Channel Lining to be reinforced with #5 bars @ 1'-0" both ways, see detail this Sheet.


Joint
1"
¾"
¾"
Rubber waterstop where indicated on the drawings
Apply with two coats of bituminous mastic

Flush joint where indicated on the drawings and where wall is in contact with compacted fill.

CONSTRUCTION JOINT
Cons't. Jt.
(VERTICAL OR HORIZONTAL)

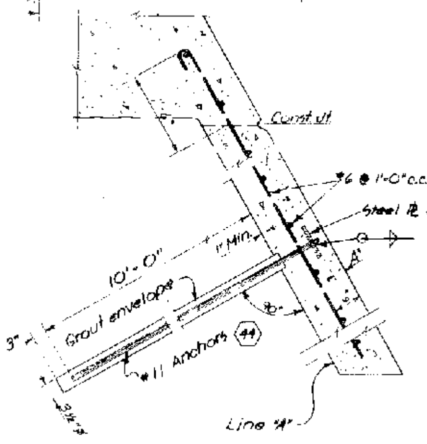
CONSTRUCTION JOINT
Cons't. Jt.
(SLOPING FACE)

CONTRACTION JOINT
Cont'r. Jt.

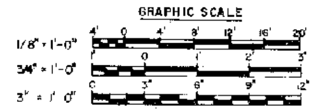
DUMMY JOINT
D.J.

Reinforcing steel to pass thru construction and dummy but not contraction joints.

STRUCTURAL JOINT DETAILS
SCALE 3" = 1'-0"



TYPICAL TYPE "B" ANCHOR BAR & REINFORCEMENT DETAIL
SCALE 3/4" = 1'-0"



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B.	K.H.W.	P.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, P. & R. BRANCH

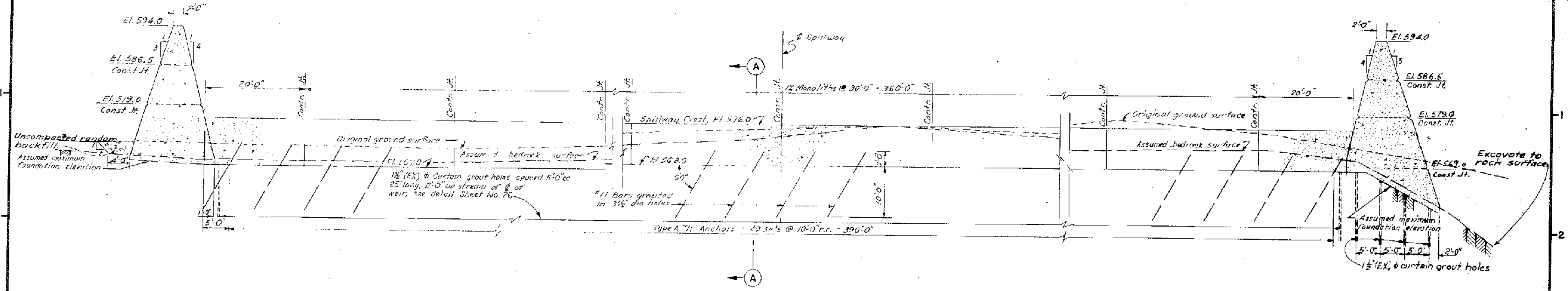
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY - WEST WALL
PLAN, ELEVATIONS AND SECTIONS NO. 1
MIDDLE, BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE 1/8" = 1'-0"
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5740
SHEET 34

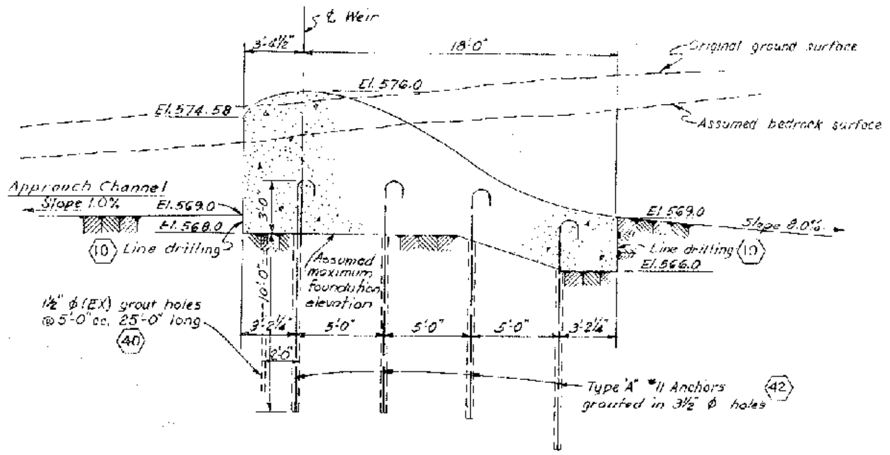
CORPS OF ENGINEERS

U. S. ARMY


El. 594.0
2'-0"
El. 586.5
Const. Jt.
El. 519.0
Const. Jt.
Uncompacted random backfill
Assumed maximum foundation elevation
4'-0"
20'-0"
5'-0"
Contr. Jt.
Original ground surface
Assumed bedrock surface
El. 567.0
1½" (EX) ϕ Curtain grout holes spaced 5'-0"cc 25' long, 2'-0" up stream of ℄ of weir, see detail Sheet No. 26
Spillway Crest, El. 576.0
El. 568.0
60°
#11 Bars grouted in 3½" dia holes
Type A "11 Anchors - 40 sets @ 10'-0" c.c. - 390'-0"
℄ Spillway
A
12 Monoliths @ 30'-0" = 360'-0"
3'-0"
10'-0"
20'-0"
2'-0"
El. 594.0
El. 586.5
Const. Jt.
El. 579.0
Const. Jt.
El. 569.0
Const. Jt.
Excavate to rock surface
Assumed maximum foundation elevation
5'-0"
5'-0"
5'-0"
2'-0"
1½" (EX) ϕ curtain grout holes

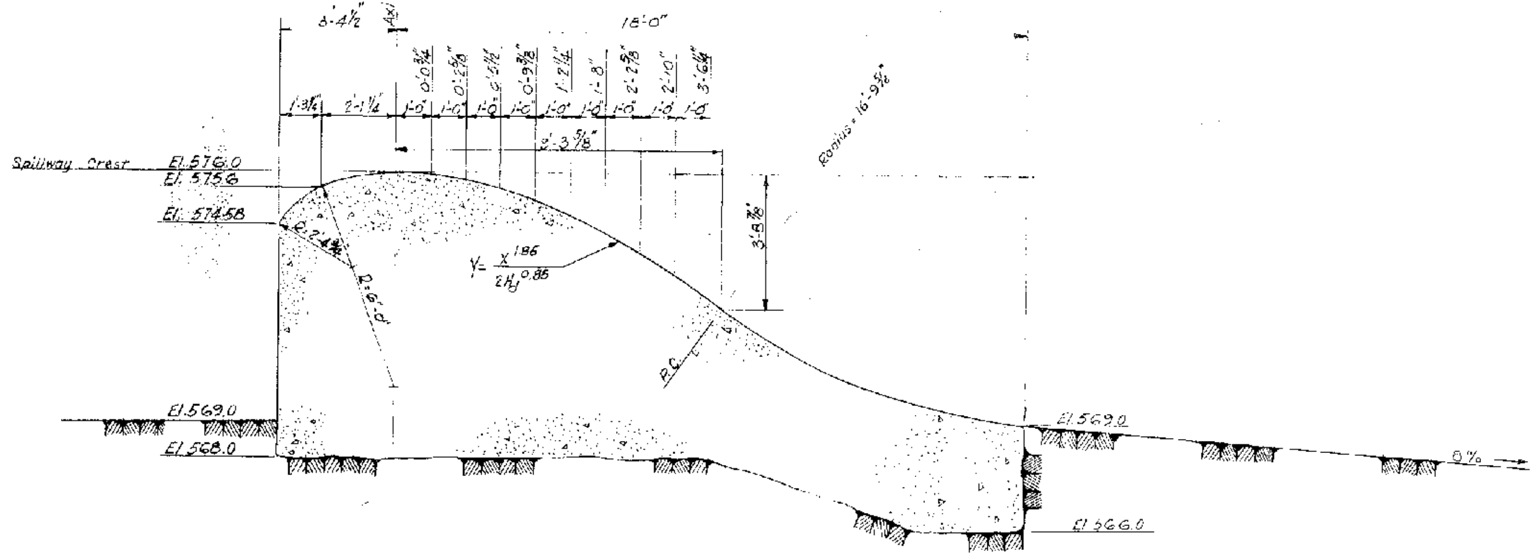
SECTION ALONG ℄ SPILLWAY WEIR

SCALE: 1/8" = 1'-0"



SECTION A-A

SCALE: 1/4" = 1'-0"

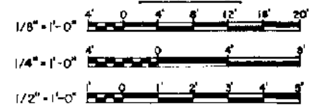


SPILLWAY WEIR CURVATURE

SCALE ½" = 1'-0"

NOTES
All elevations refer to Mean Sea Level Datum.
Concrete in spillway weir will be paid for under Item No. 47.
Concrete in retaining walls will be paid for under Item No. 45.
For general notes see Sheet No. 31
For structural joint detail see Sheet No. 34
Figures in hexagons indicate item numbers under which payment will be made.

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.J.B. | DR. BY K.H.W. | CK. BY R.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, B. J. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY
WEIR SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

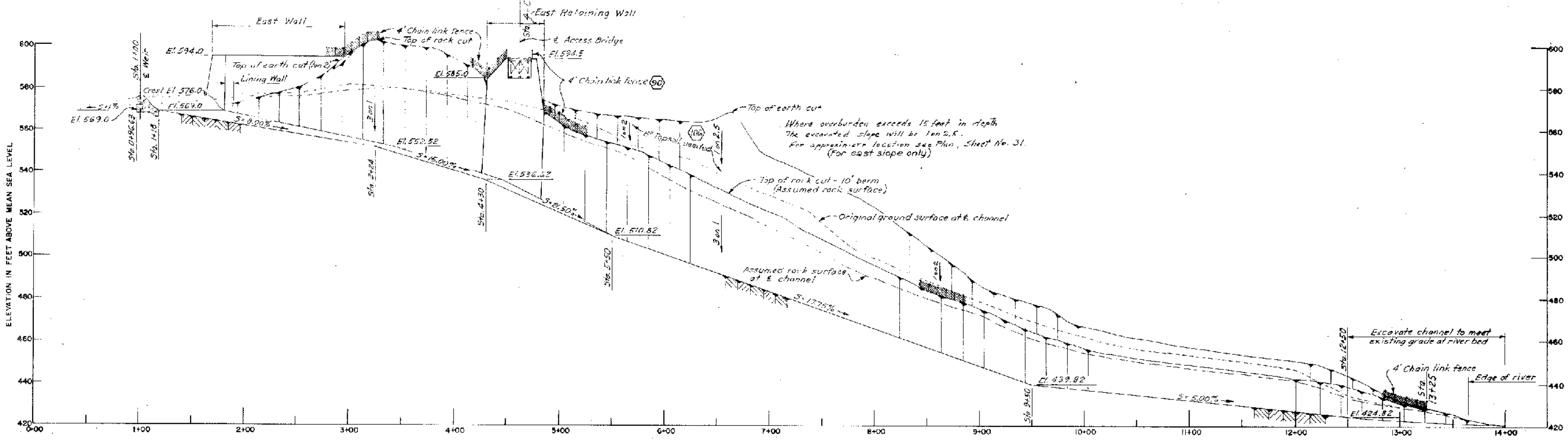
DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5739

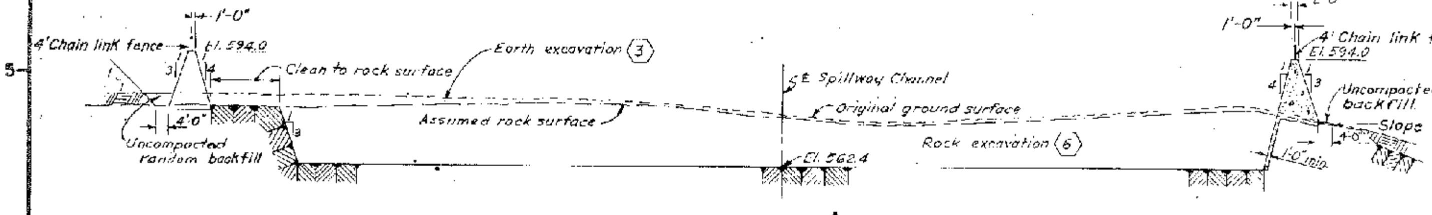
SHEET 33

CORPS OF ENGINEERS U.S. ARMY



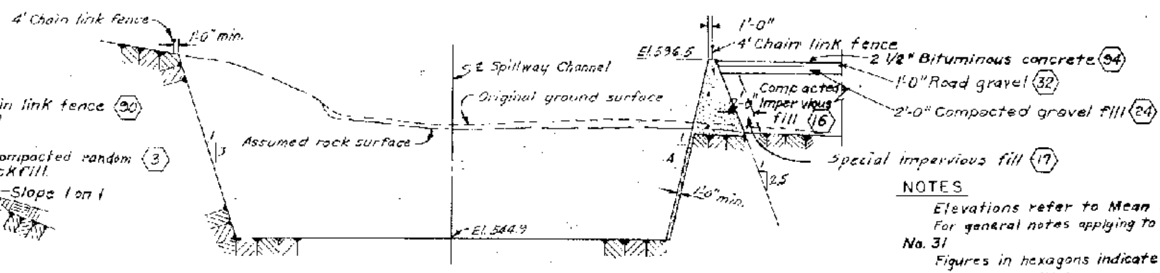
PROFILE ALONG ℄ CHANNEL

SCALE: HOR. 1" = 40'
VERT. 1" = 20'



SECTION $\frac{A}{31}$

SCALE: 1" = 20'



SECTION $\frac{B}{31}$

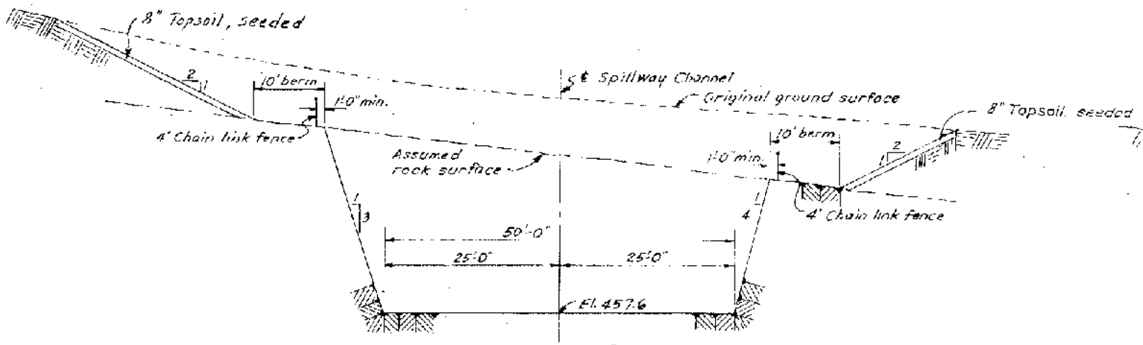
SCALE: 1" = 20'

NOTES

Elevations refer to Mean Sea Level Datum.

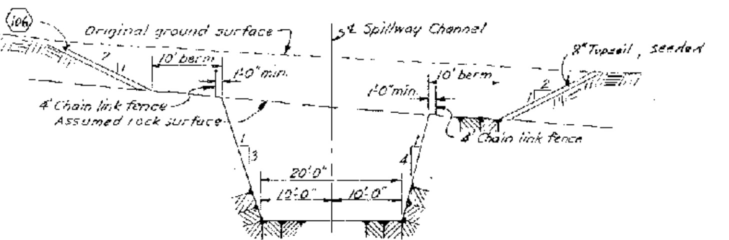
For general notes applying to this sheet, see Sheet No. 31

Figures in hexagons indicate item numbers under which payment will be made.



SECTION $\frac{C}{31}$

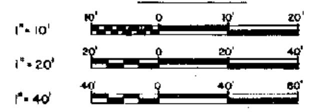
SCALE: 1" = 10'



SECTION $\frac{D}{31}$

SCALE: 1" = 10'

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.J.B. | DR. BY K.H.W. | CK. BY R.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, P. & S. BRANCH

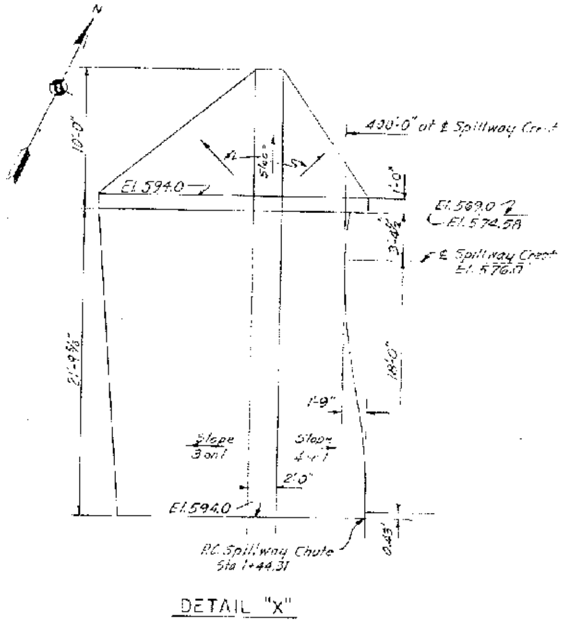
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY
PROFILE AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

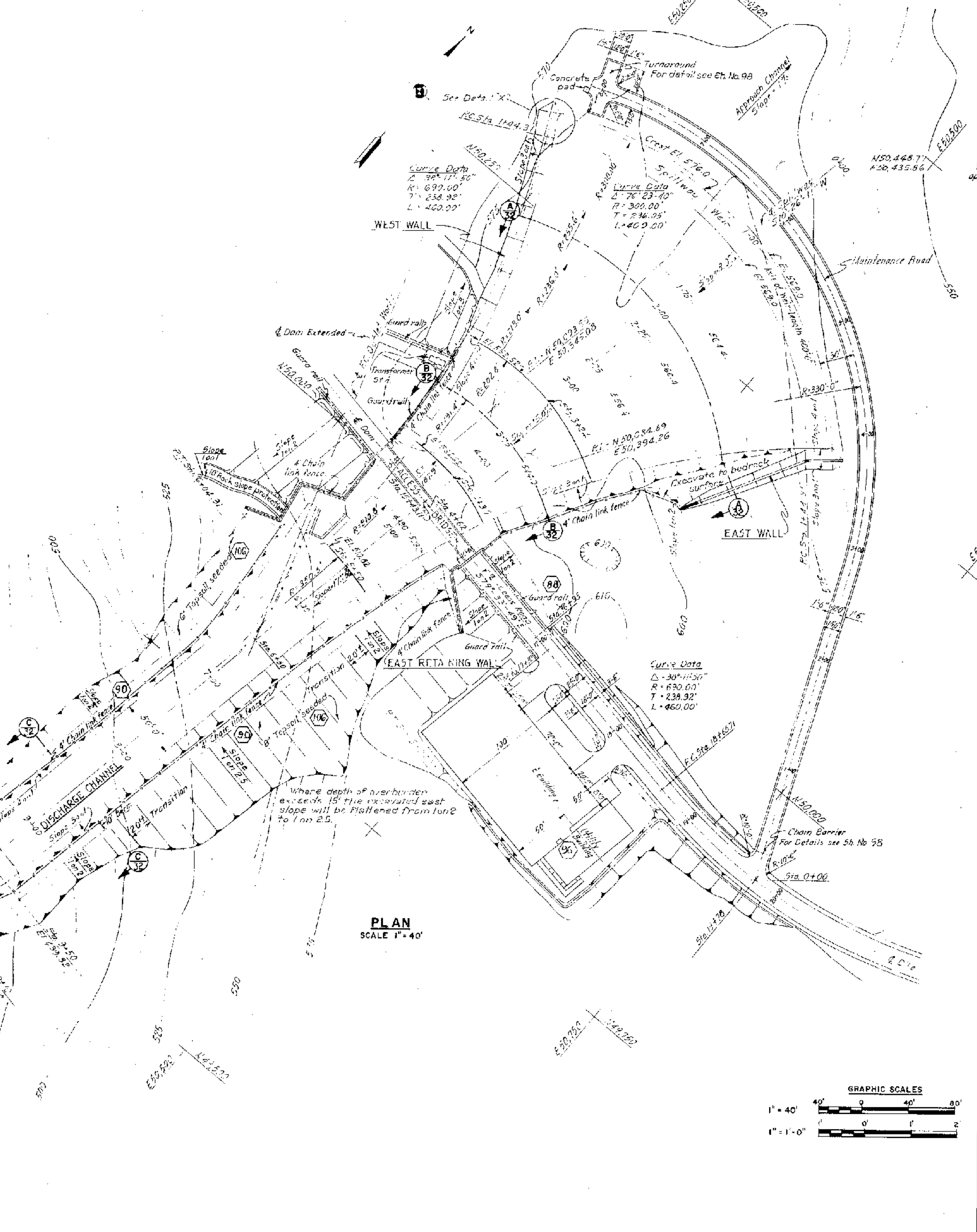
SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-45
DRAWING NUMBER
CT-1-5738
SHEET 32

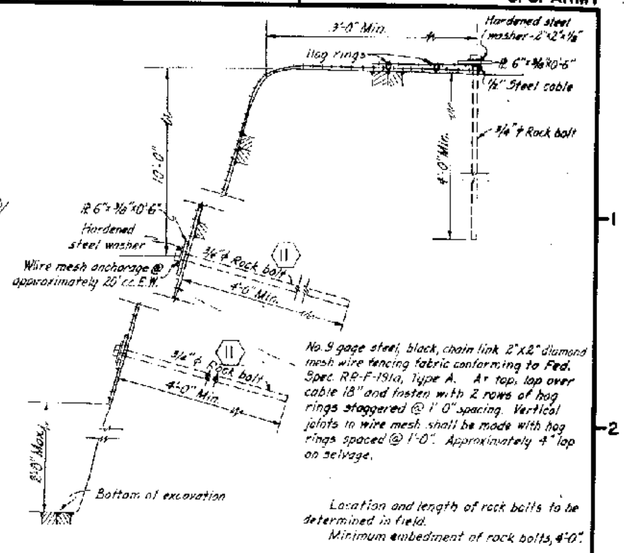
CORPS OF ENGINEERS

U. S. ARMY



DETAIL "X"
SCALE 1" = 5'-0"





No. 9 gage steel, black, chain link 2"x2" diamond mesh wire fencing fabric conforming to Fed. Spec. RR-F-191a, Type A. At top, lap over cable 18" and fasten with 2 rows of hog rings staggered @ 1'-0" spacing. Vertical joints in wire mesh shall be made with hog rings spaced @ 1'-0". Approximately 4" lap on selvage.

Location and length of rock bolts to be determined in field.
Minimum embedment of rock bolts, 4'-0".

CHAIN LINK WIRE SAFETY MESH ⑪
SLOPE PROTECTION
SCALE: 1" = 1'-0"

NOTES:

Elevations refer to Mean Sea Level Datum.
For embankment sections, see Sheet No. 25.
For profile along ℄ of spillway channel and channel sections, see Sheet No 32.
Figures in hexagons indicate item numbers under which payment will be made.

Coordinates are based on a local grid. Origin is county bound at intersection of Hampden and Hampshire Counties and is designated as N50,000-E50,000

For maintenance road sections, details, profile and turnaround see Sheet No. 98.

GRAPHIC SCALES
1" = 40' — 40' 0 40' 80'
1" = 1'-0" — 1' 0' 1' 2

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B.	K.H.W.	P.H.

PROJECT ENGINEER J. Hartlen

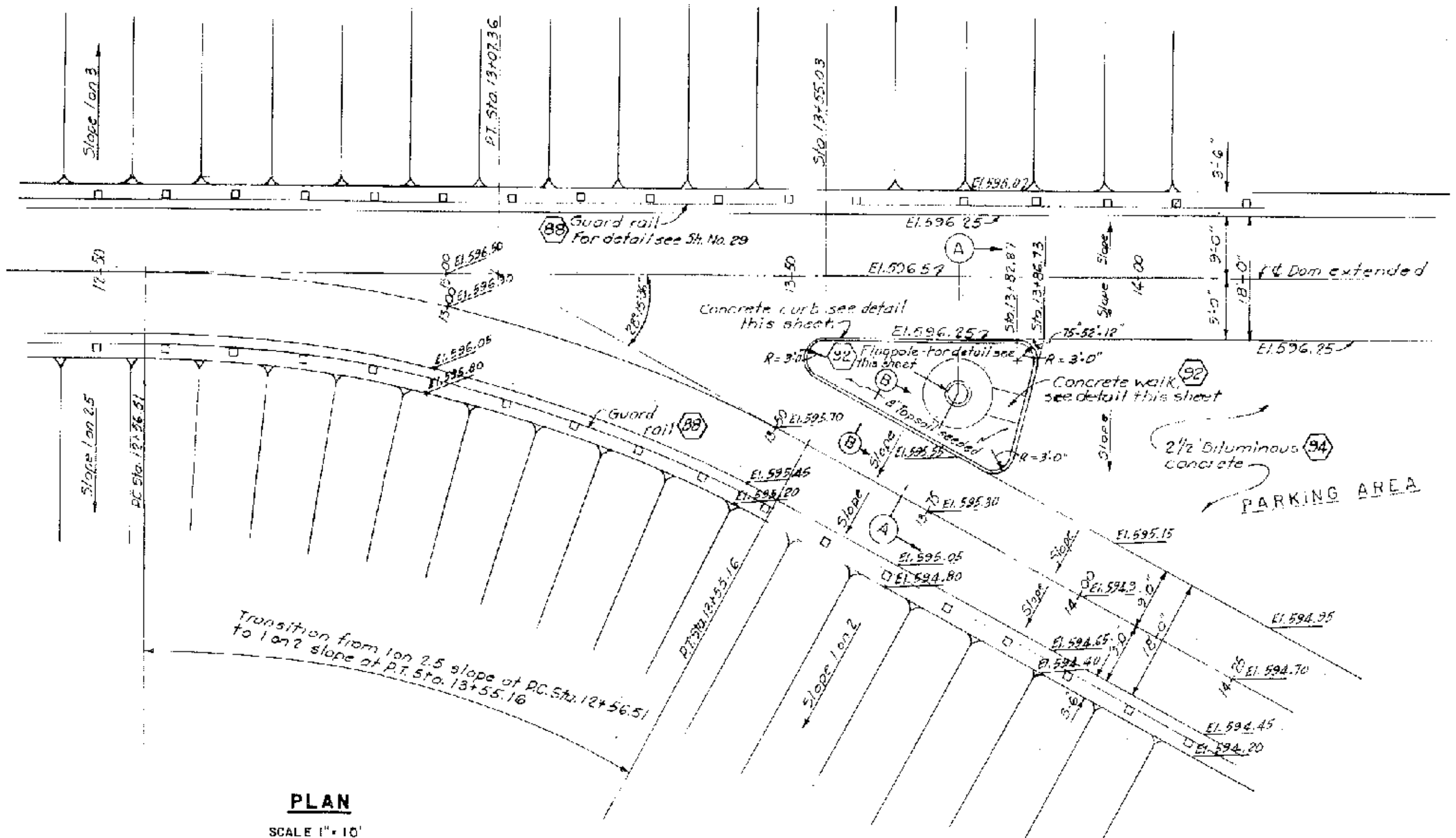
APPROVAL RECOMMENDED J. C. Dingwall CHIEF, H. ENGR. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY
PLAN AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED CHIEF, ENGINEERING DIVISION

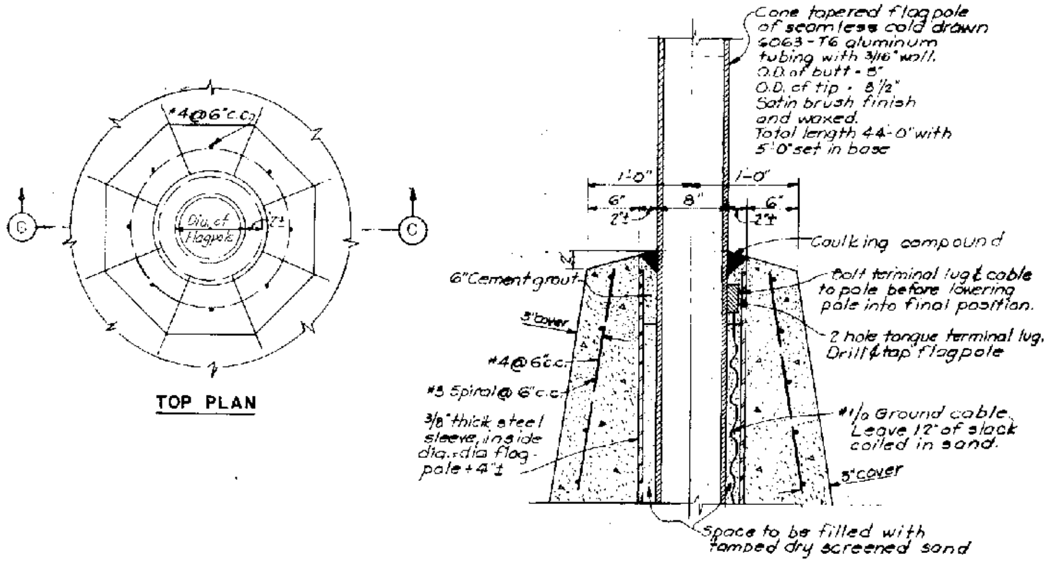
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 9-016-62-40
DRAWING NUMBER
CT-1-5737
SHEET 31



PLAN

SCALE 1" = 10'

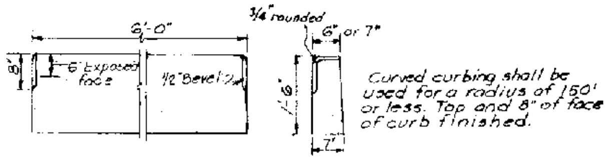

#4 @ 6" c.c.
Dia. of Flagpole
2"±
C
Cone tapered flagpole of seamless cold drawn 6063-T6 aluminum tubing with 3/16" wall. O.D. of butt - 8" O.D. of tip - 3½" Satin brush finish and waxed. Total length 44'-0" with 5'-0" set in base
1'-0"
1'-0"
6"
8"
6"
2"±
2"±
Caulking compound
6" Cement grout
3" cover
Bolt terminal lug & cable to pole before lowering pole into final position.
2 hole tongue terminal lug. Drill & tap flagpole
#4 @ 6" c.c.
#3 Spiral @ 6" c.c.
3/8" thick steel sleeve, inside dia. = dia. flagpole + 4"±
#1/0 Ground cable. Leave 12" of slack coiled in sand.
5" cover
Space to be filled with tamped dry screened sand

TOP PLAN

SECTION C-C

FLAGPOLE DETAILS ⟨92⟩

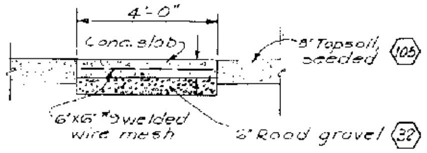
SCALE 1½" = 1'-0"



Curved curbing shall be used for a radius of 150' or less. Top and 8" of face of curb finished.

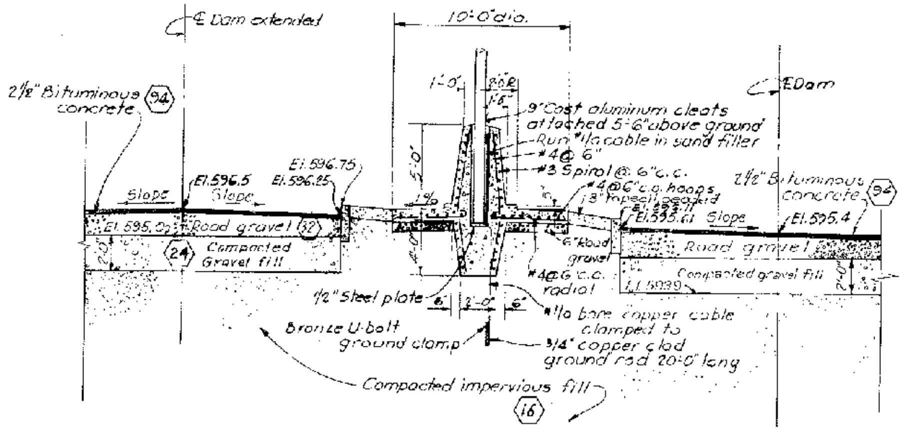
PRE-CAST CONCRETE VERTICAL CURB ⟨91⟩

NOT TO SCALE



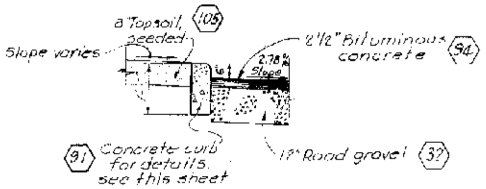
CONCRETE WALK DETAIL ⟨92⟩

SCALE ½" = 1'-0"



SECTION A-A

SCALE ¼" = 1'-0"


8" Topsoil, seeded 105
Slope varies
2½" Bituminous concrete 94
2.78% Slope
91 Concrete curb for details see this sheet
12" Road gravel 32

SECTION B-B

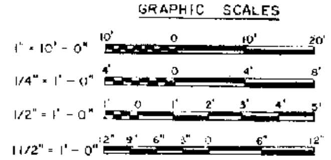
SCALE ½" = 1'-0"

NOTES

For location of Parking Area see Sheet No. 38.

Figures in hexagons indicate item numbers under which payment will be made.

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R. H.
DR. BY A.J.H.
CK. BY J.H.
PROJECT ENGINEER

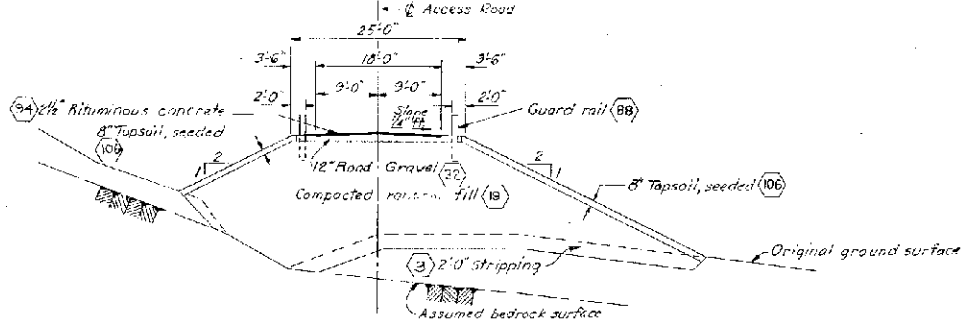
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM

PARKING AREA AND FLAG POLE DETAILS

MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

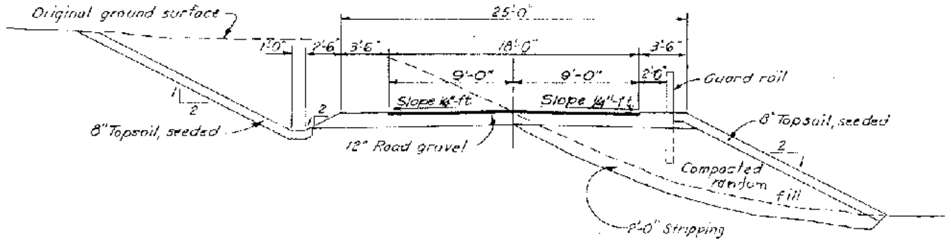
APPROVAL RECOMMENDED
CHIEF, F. & B. BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5736
SHEET 30



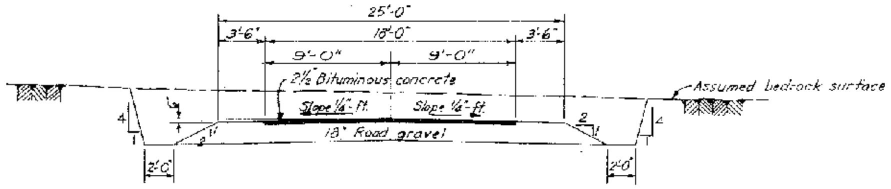
ACCESS ROAD SECTION AT STA. 16+45

SCALE: 1" = 10'



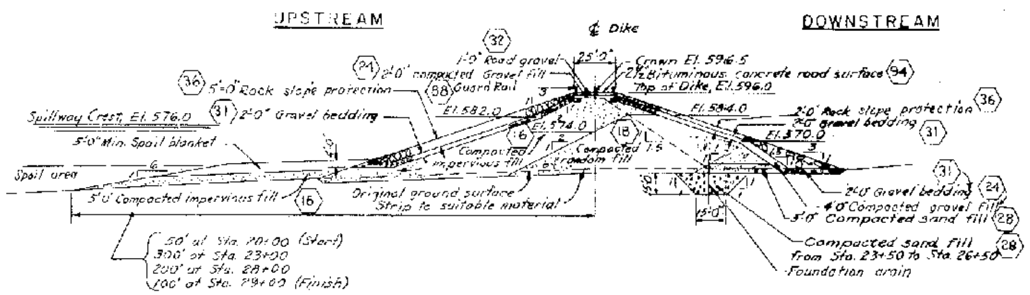
TYPICAL ACCESS ROAD SECTION

SCALE: 1" = 5'



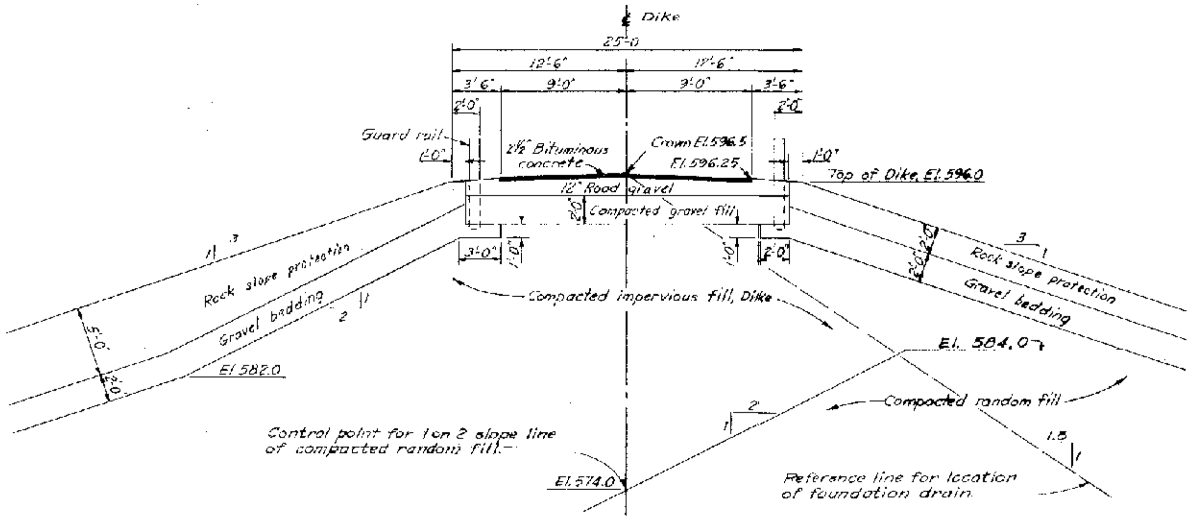
TYPICAL ACCESS ROAD SECTION IN ROCK

SCALE: 1" = 5'


UPSTREAM
DOWNSTREAM
℄ Dike
(32) 1'-0" Road gravel
25'-0"
Crown El. 596.5
(24) 2'-0" compacted Gravel fill
2½" Bituminous concrete road surface (94)
(88) Guard Rail
Top of Dike, El. 596.0
(36) 5'-0" Rock slope protection
2'-0" Rock slope protection (36)
(31) 2'-0" Gravel bedding
2'-0" gravel bedding (31)
Spillway Crest, El. 576.0
El. 582.0
El. 584.0
El. 574.0
El. 570.0
5'-0" Min. Spoil blanket
Spoil area
(16) Compacted impervious fill
(18) Compacted random fill
5'-0" Compacted impervious fill (16)
Original ground surface
Strip to suitable material
2'-0" Gravel bedding (31)
4'-0" Compacted gravel fill (24)
5'-0" Compacted sand fill (28)
Compacted sand fill from Sta. 23+50 to Sta. 26+50 (28)
Foundation drain
50' at Sta. 20+00 (Start)
300' at Sta. 23+00
200' at Sta. 28+00
100' at Sta. 29+00 (Finish)

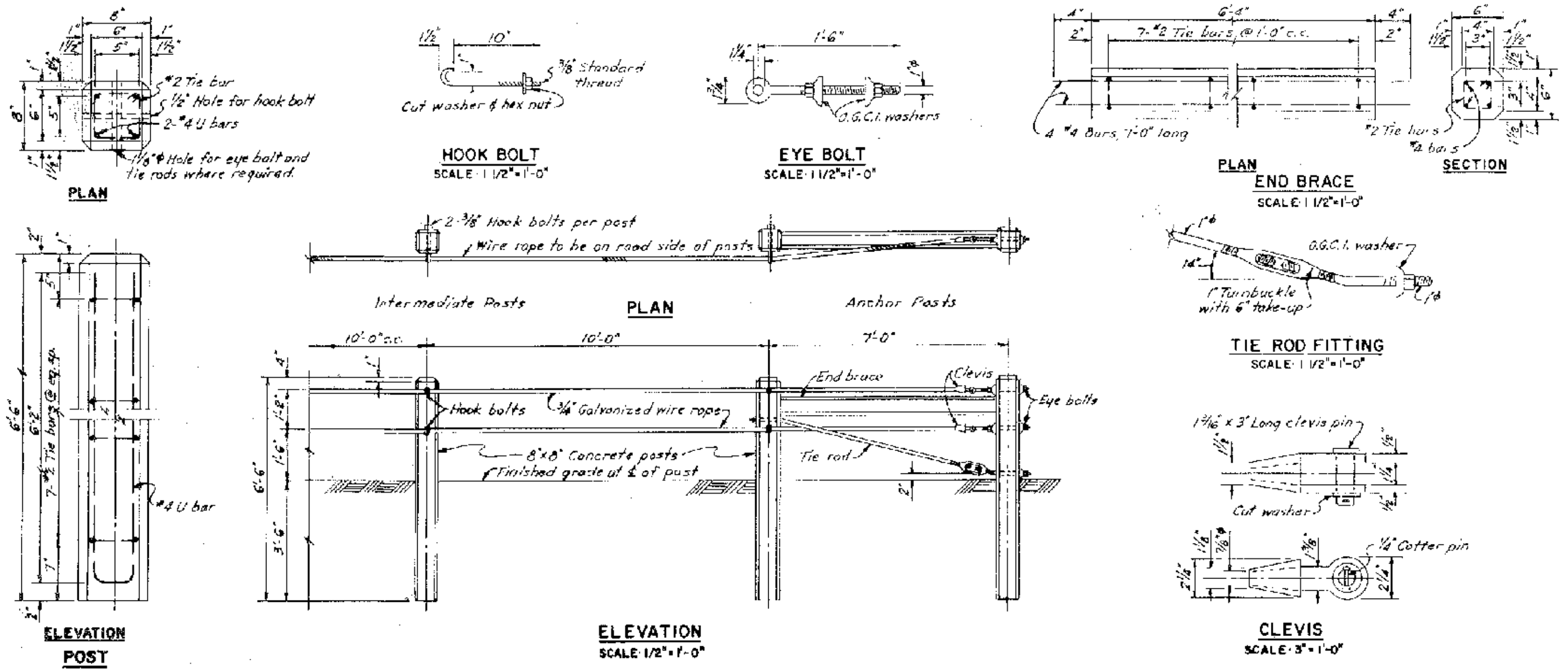
TYPICAL DIKE SECTION

SCALE: 1" = 40'



TOP OF DIKE DETAIL

SCALE: 1" = 5'



(88) CABLE GUARD RAIL DETAILS

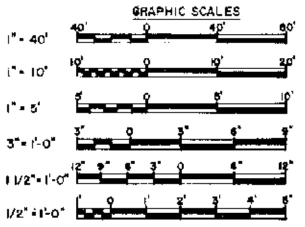
NOTES

Elevations refer to Mean Sea Level Datum.

For general notes applying to this sheet, see Sheet No. 2

Figures in hexagons indicate item numbers under which payment will be made.

For profile along center line of Access Road and Dike see Sheet No. 28.



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R.H. K.H.W. | DR. BY K.H.W. | CK. BY R.H.

PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
DIKE SECTIONS AND ACCESS ROAD
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVAL RECOMMENDED
CHIEF, ... BRANCH

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

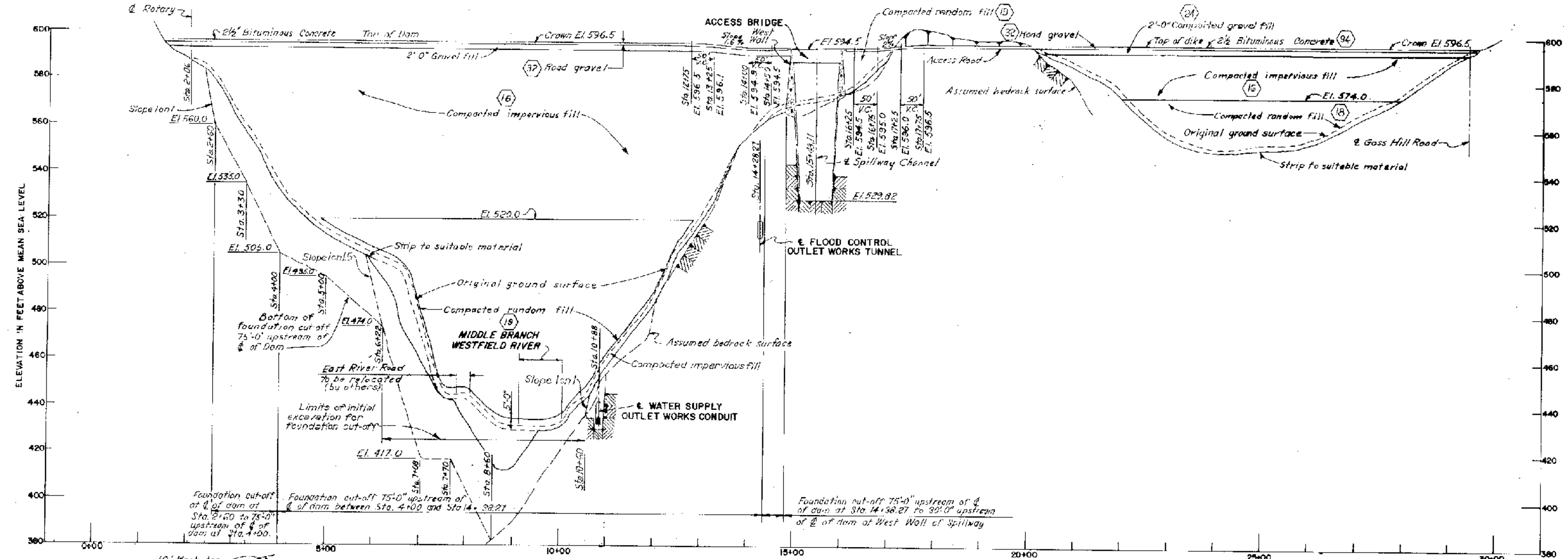
SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-41

DRAWING NUMBER
CT-1-5735

SHEET 29

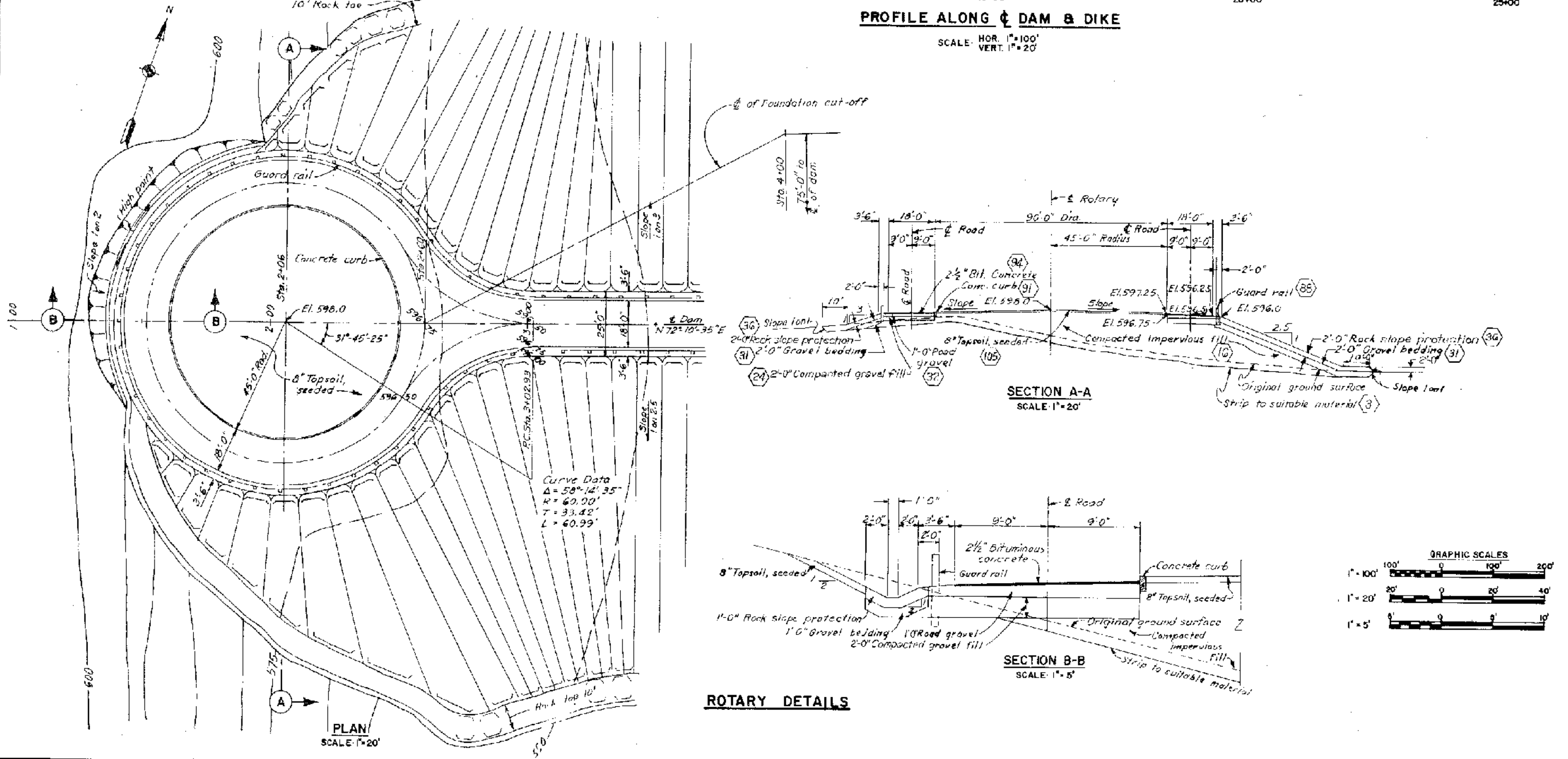
CORPS OF ENGINEERS

U.S. ARMY



PROFILE ALONG ℄ DAM & DIKE

SCALE: HOR. 1" = 100'
VERT. 1" = 20'



ROTARY DETAILS

NOTES:

Elevations refer to mean sea level datum.
For general notes applying to this sheet, see Sh. No. 2.
For embankment sections and details, see Sh. Nos. 25 & 29
For details of guard rail, see Sh. No. 29
Figures in hexagons indicate item numbers under which payment will be made.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY P.H. K.H.W. | DR. BY K.H.W. | CK. BY F.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, [illegible] BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
DAM AND DIKE PROFILES
AND ROTARY DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

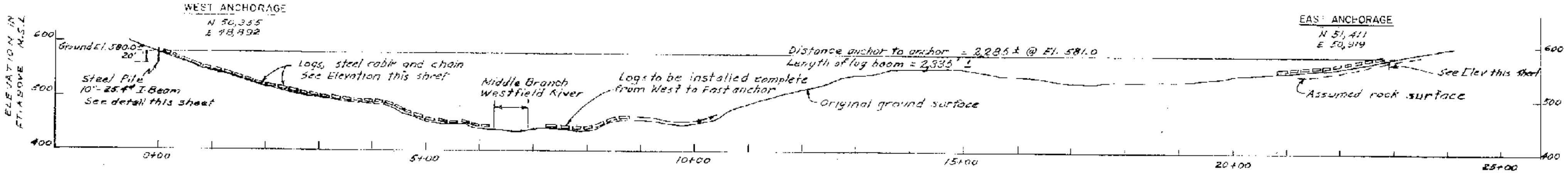
DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5734

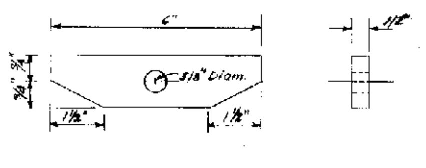
SHEET 28

CORPS OF ENGINEERS U. S. ARMY


WEST ANCHORAGE
N 50,355
E 48,892
ELEVATION IN FT. ABOVE M.S.L.
600
500
400
Ground El. 580.0±
20'
Steel Pile 10"-25.4# I-Beam See detail this sheet
Logs, steel cable and chain See Elevation this sheet
Middle Branch Westfield River
Logs to be installed complete from West to East anchor
Distance anchor to anchor = 2,285 ± @ El. 581.0
Length of log boom = 2,335' ±
Original ground surface
EAST ANCHORAGE
N 51,411
E 50,919
See Elev this sheet
Assumed rock surface
0+00
5+00
10+00
15+00
20+00
25+00

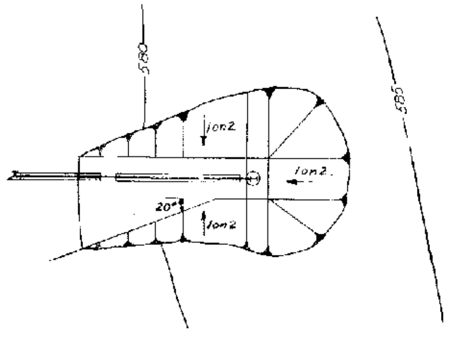
PROFILE ALONG ℄ LOG BOOM

(LOOKING UPSTREAM)
SCALE: 1"=100'



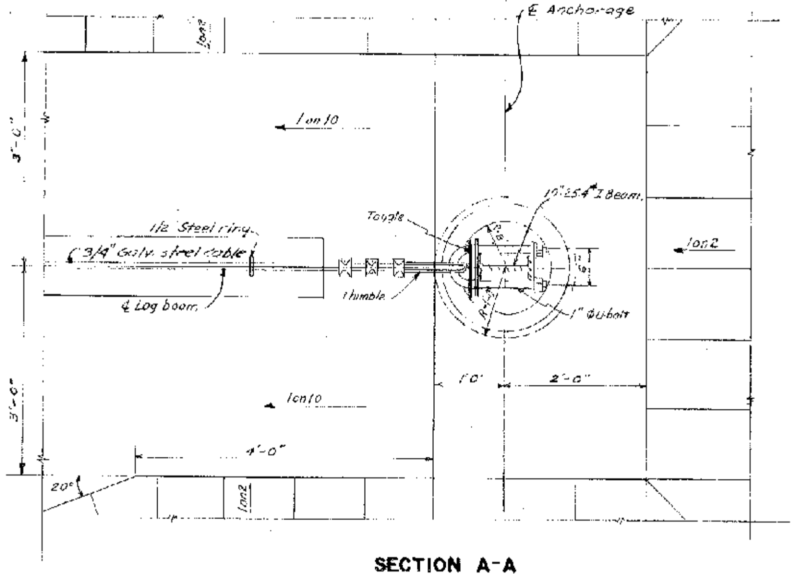
DETAIL, STEEL TOGGLE

SCALE: 6"=1'-0"



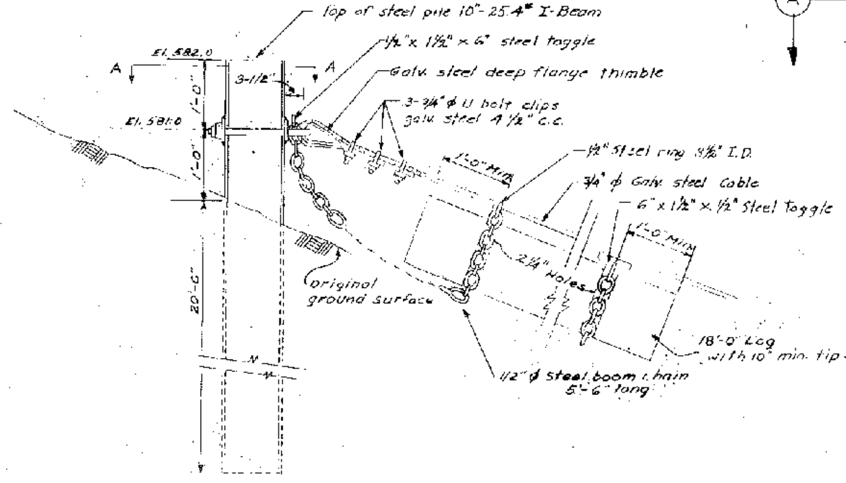
PLAN-EAST ANCHOR

SCALE: 1"=10'



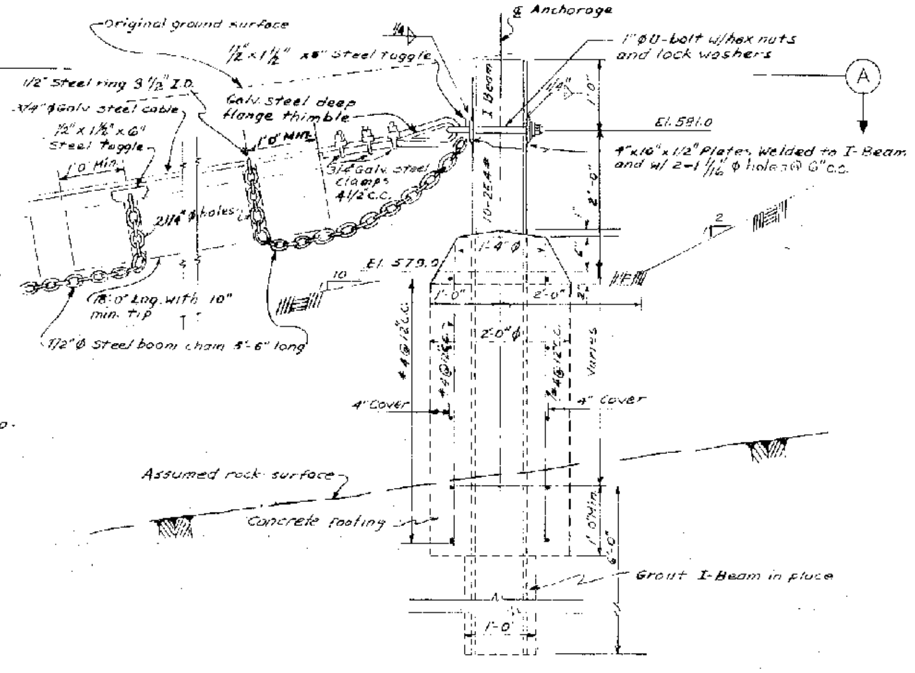
SECTION A-A

SCALE: 1"=1'-0"


Top of steel pile 10"-25.4# I-Beam
½"x 1½" x 6" steel toggle
Galv. steel deep flange thimble
3-¾" φ U bolt clips galv. steel 4½" c.c.
½" Steel ring 3½" I.D.
¾" φ Galv. steel Cable
6" x 1½" x ½" Steel Toggle
1'-0" Min
1'-0" Min
2¼" Holes
18'-0" Log with 10" min. tip
½" φ Steel boom chain 5'-6" long
Original ground surface
El. 582.0
El. 581.0
A
A
3-1/2"
1'-0"
1'-0"
20'-0"

ELEVATION-WEST ANCHOR

SCALE: 1"=1'-0"



ELEVATION-EAST ANCHOR

SCALE 1"=1'-0"

NOTES.
Elevations refer to Mean Sea Level Datum
For location of Log Boom See Sheet No. 2.
Log Boom and accessories will be paid for under Item No. 93.

GRAPHIC SCALES

1" = 1'-0"	1'	0	1'	2'
1" = 10'	10'	0	10'	20'
1" = 100'	100'	0	100'	200'
6" = 1'-0"	6"	0	6"	12"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.J.B. | DR. BY W.M.B. | CK. BY P.H.

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM

LOG BOOM DETAILS

MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

PROJECT ENGINEER

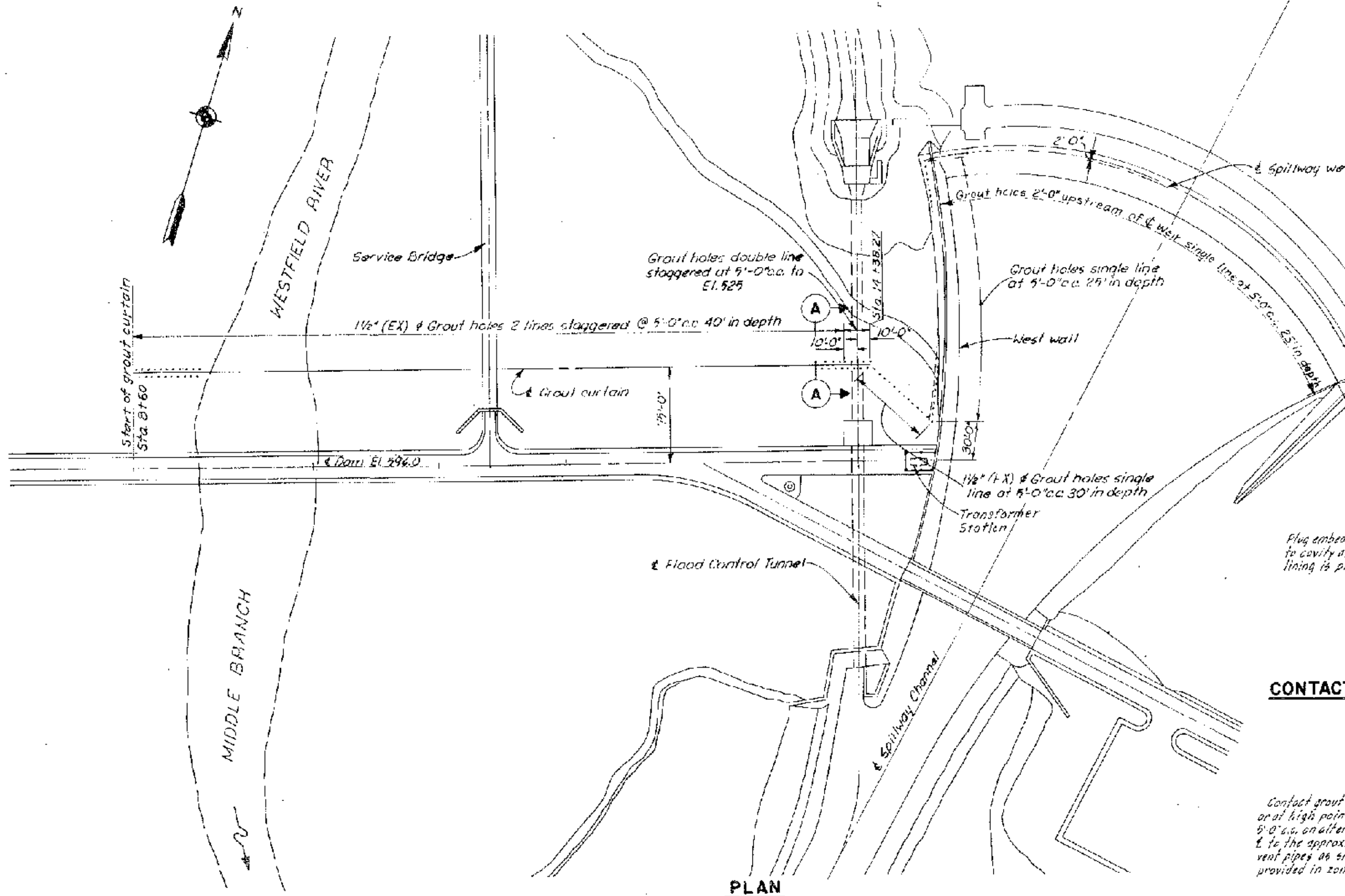
APPROVAL RECOMMENDED
CHIEF, BRANCH

APPROVED
CHIEF, ENGINEERING DIVISION

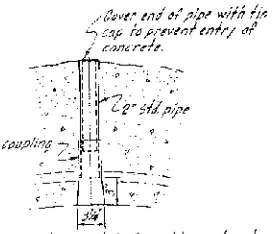
DATE MARCH 1962

SCALE: 1/8"=1'-0"
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5733
SHEET 27

CORPS OF ENGINEERS U. S. ARMY

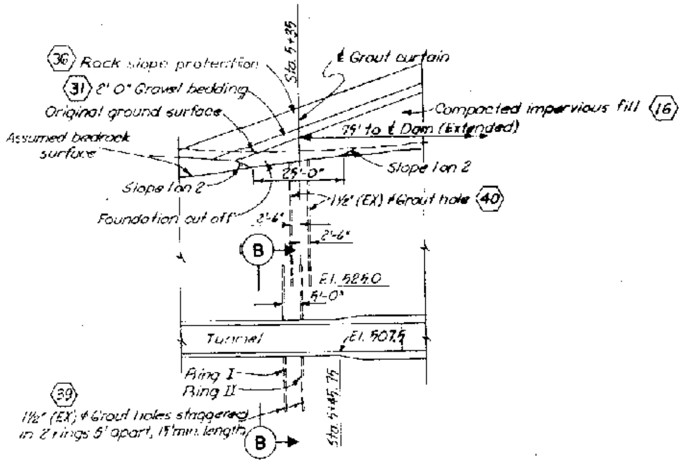

N
WESTFIELD RIVER
MIDDLE BRANCH
Service Bridge
Start of grout curtain Sta. 8+60
1½" (EX) ⌀ Grout holes 2 lines staggered @ 5'-0"c.c. 40' in depth
℄ Grout curtain
75'-0"
℄ Dam El. 596.0
Grout holes double line staggered at 5'-0"c.c. to El. 525
A
Sta. 14+38.27
10'-0"
10'-0"
Grout holes 2'-0" upstream of ℄ weir single line at 5'-0"c.c. 25' in depth
℄ Spillway weir
2'-0"
Grout holes single line at 5'-0"c.c. 25' in depth
West wall
30'-0"
1½" (EX) ⌀ Grout holes single line at 5'-0"c.c. 30' in depth
Transformer Station
℄ Flood Control Tunnel
℄ Spillway Channel

PLAN
SCALE 1" = 50'

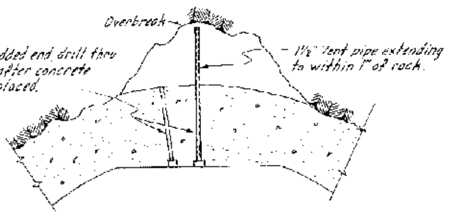

Cover end of pipe with tin cap to prevent entry of concrete.
2" std. pipe
2" std. coupling
3¼"

Conical recess to be formed by wooden plug or other means of protecting coupling from damage or fouling by concrete. Plug shall be oil-soaked or greased. Contractor may use pipe nipples in lieu of conical wooden plugs. Nipples shall not be in recess when holes are plugged.

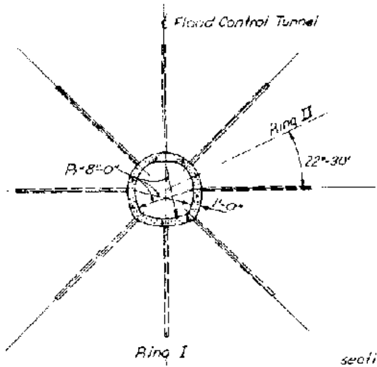
GROUT PIPE DETAIL
NOT TO SCALE



SECTION A-A
SCALE 1" = 20'


Overbreak
Plug embedded end, drill thru to cavity after concrete lining is placed.
1½" vent pipe extending to within 1" of rock.

CONTACT GROUTING IN EXCESSIVE OVERBREAK ZONES
DETAIL "A"
NOT TO SCALE



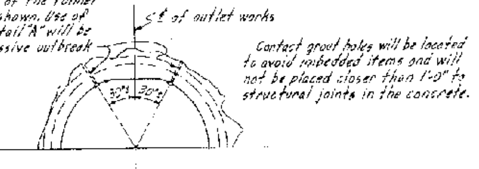
SECTION B-B
SCALE 1" = 10'

Grout curtain omitted from this section for clarity.

Ring II (not shown) is rotated 22°-30' from Ring I as indicated.

1½" (EX) ⌀ Grout holes 15' minimum depth penetration and/or 10' minimum penetration beyond natural fracturing or fracturing caused by tunnel excavation.

Contact grout holes to be placed beneath or at high points of excavation at approx. 5'-0"c.c. on alternate sides of the tunnel ℄ to the approx. angles as shown. Use of vent pipes as shown in Detail "A" will be provided in zones of excessive outbreak.



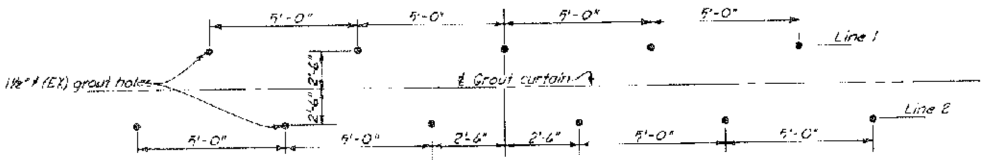
Contact grout holes will be located to avoid imbedded items and will not be placed closer than 1'-0" to structural joints in the concrete.

Contact grout holes in the transition sections will be located at approximately 5'-0"c.c. longitudinally, and at a lateral spacing to most advantageously seal existing voids between the rock and the concrete.

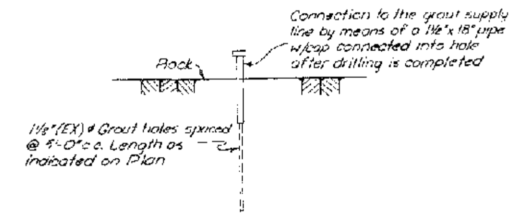
CONTACT GROUT DETAIL
NOT TO SCALE

NOTES:

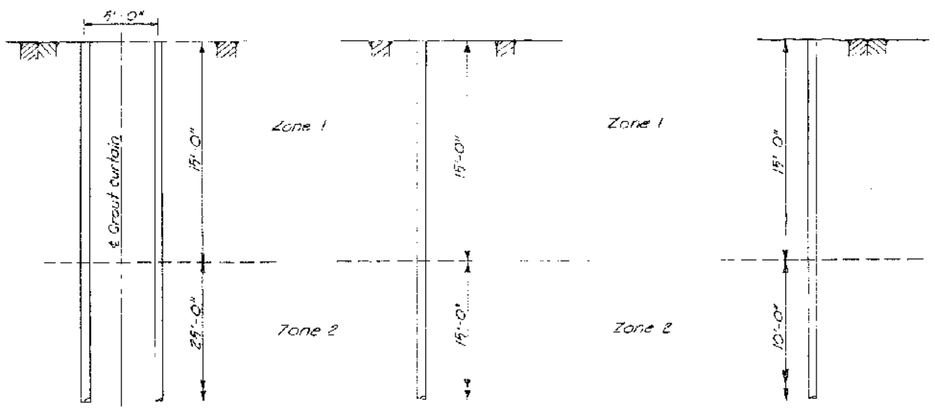
Elevations refer to Mean Sea Level Datum.
Tunnel drilling and grouting to be paid for under Item No. 39.
Foundation drilling and grouting to will be paid for under Item No. 40.



PLAN
TYPICAL INITIAL GROUT HOLE SPACING
ALONG DAM FOUNDATION CUTOFF
(NOT TO SCALE)


Connection to the grout supply line by means of a 1½"x 18" pipe w/cap connected into hole after drilling is completed
Rock
1½" (EX) ⌀ Grout holes spaced @ 5'-0"c.c. Length as indicated on Plan

GROUT HOLE DETAIL
(NOT TO SCALE)



DAM
STA 8+60 TO STA. 14+38.27

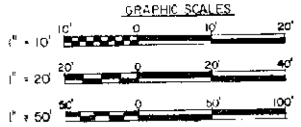
DAM
STA. 14+38.27 TO WEST WALL
OF SPILLWAY

NOTE:
Grouting in Zone 1 to be completed prior to grouting Zone 2.
Exposed rock surface in base of Foundation Cutoff to be hand cleaned.

SPILLWAY
WEST WALL AND WEIR

TYPICAL SECTIONS - GROUT CURTAIN
(NOT TO SCALE)

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
P. H.	F.L.C.	J.H.

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GROUTING PLAN AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

PROJECT ENGINEER

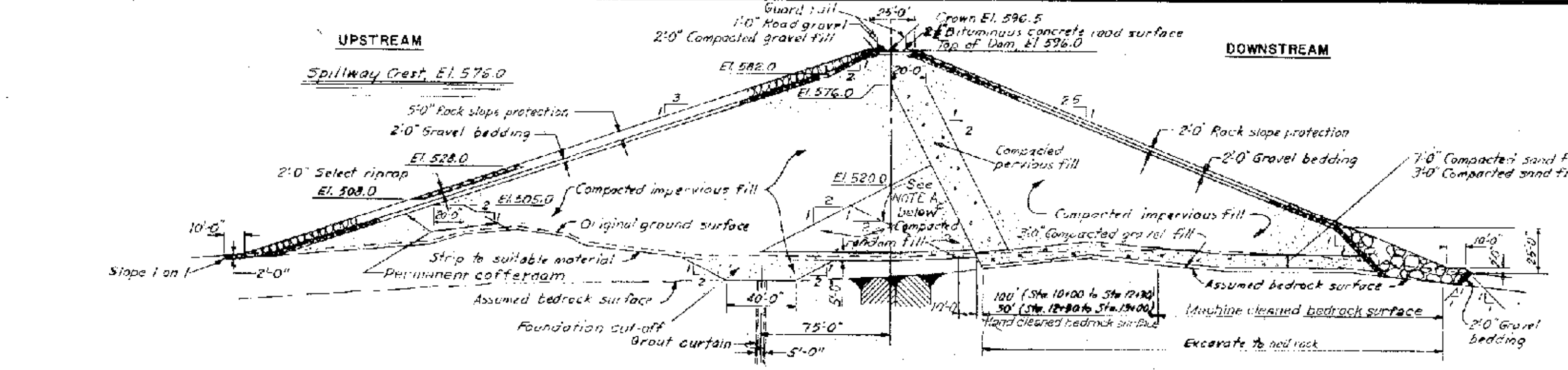
APPROVAL RECOMMENDED
CHIEF, BRANCH

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV ENG. 19-016-62-45
DRAWING NUMBER
CT-1-5732
SHEET 26

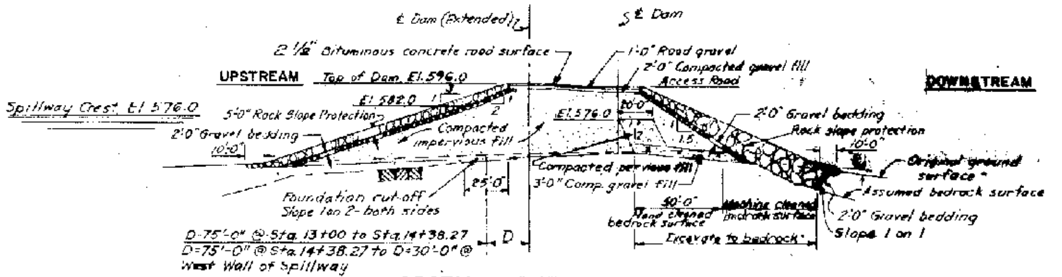
CORPS OF ENGINEERS U.S. ARMY



SECTION AT STA. 11+65

(TYPICAL FROM STA. 10+00 TO STA. 13+00)

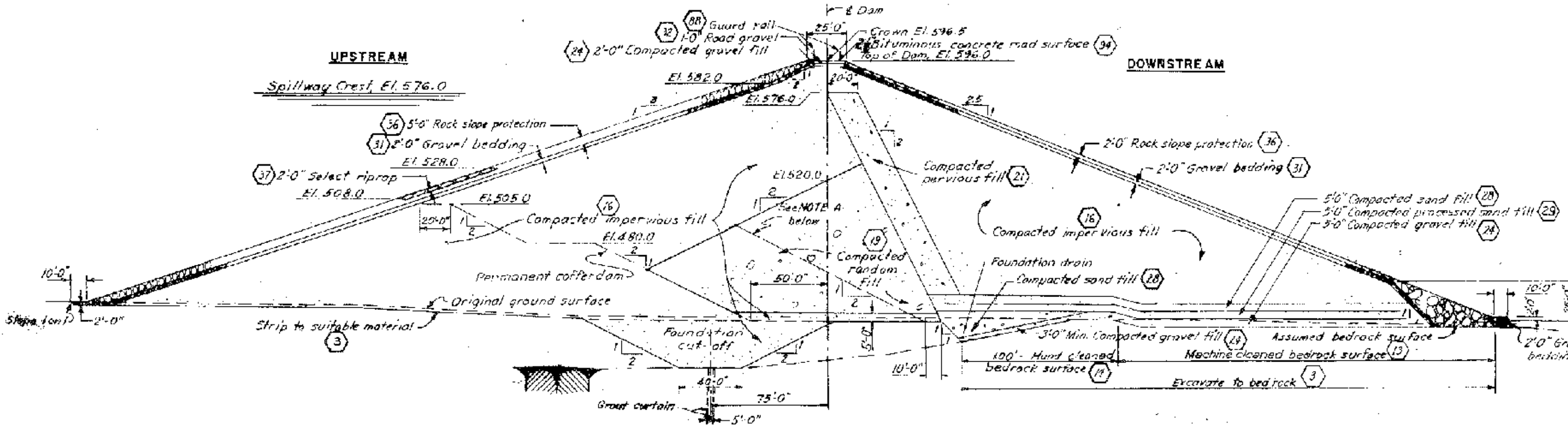
SCALE: 1" = 40'



SECTION AT STA. 14+00

(TYPICAL FROM STA. 13+00 TO STA. 14+84.27)

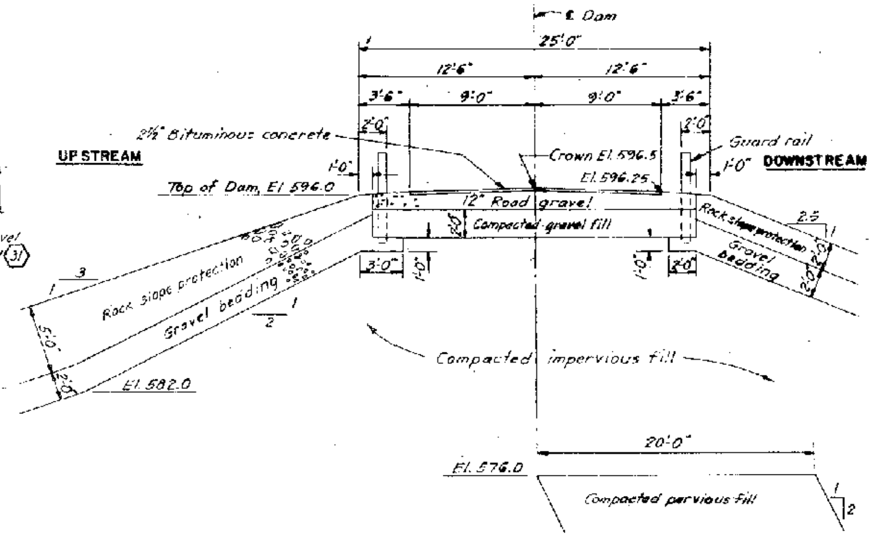
SCALE: 1" = 40'


℄ Dam
UPSTREAM
Spillway Crest, El. 576.0
(88) Guard rail
(32) 1'-0" Road gravel
(24) 2'-0" Compacted gravel fill
25'-0"
Crown El. 596.5
2½" Bituminous concrete road surface (94)
Top of Dam, El. 596.0
DOWNSTREAM
El. 582.0
El. 576.0
(36) 5'-0" Rock slope protection
(31) 2'-0" Gravel bedding
El. 528.0
(37) 2'-0" Select riprap
El. 508.0
El. 505.0
20'-0"
(16) Compacted impervious fill
El. 480.0
Permanent cofferdam
Original ground surface
Strip to suitable material (3)
Slope 1 on 1
10'-0"
2'-0"
El. 520.0
See NOTE A below
(19) Compacted random fill
50'-0"
Foundation cut-off
40'-0"
75'-0"
Grout curtain
5'-0"
20'-0"
Compacted pervious fill (21)
2'-0" Rock slope protection (36)
2'-0" Gravel bedding (31)
(16) Compacted impervious fill
Foundation drain
Compacted sand fill (28)
5'-0" Compacted sand fill (28)
5'-0" Compacted processed sand fill (29)
5'-0" Compacted gravel fill (24)
3'-0" Min. Compacted gravel fill (24)
Assumed bedrock surface
100' - Hand cleaned bedrock surface (14)
Machine cleaned bedrock surface (13)
Excavate to bedrock (3)
10'-0"
2'-0" Gravel bedding (31)
10'-0"
25'-0"
2.5
1
2
3

SECTION AT STA. 9+50

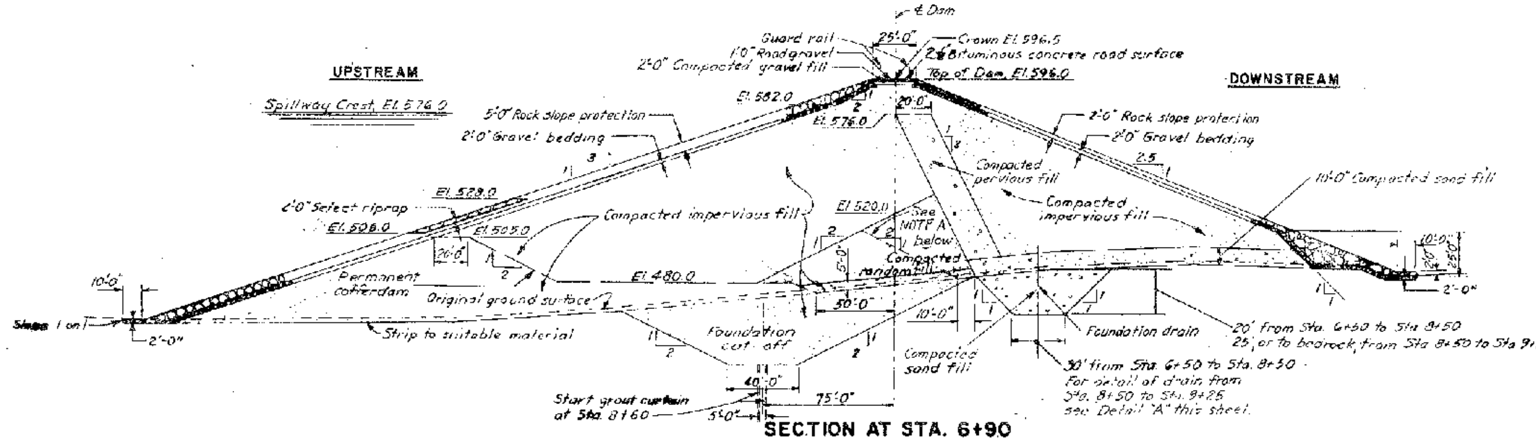
(TYPICAL FROM STA 9+25 TO STA 10+00)

SCALE: 1" = 40'



TOP OF DAM DETAIL

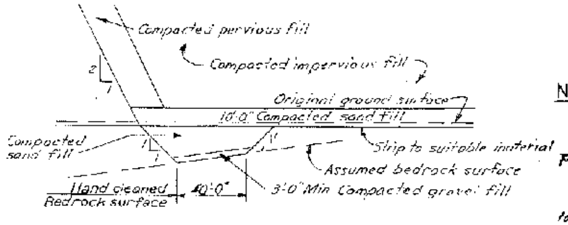
SCALE: 1" = 5'


℄ Dam
UPSTREAM
Spillway Crest, El. 576.0
Guard rail
1'-0" Road gravel
2'-0" Compacted gravel fill
25'-0"
Crown El. 596.5
2½" Bituminous concrete road surface
Top of Dam, El. 596.0
DOWNSTREAM
El. 582.0
El. 576.0
5'-0" Rock slope protection
2'-0" Gravel bedding
El. 528.0
2'-0" Select riprap
El. 508.0
El. 505.0
20'-0"
Compacted impervious fill
Permanent cofferdam
Original ground surface
El. 480.0
Strip to suitable material
Slope 1 on 1
10'-0"
2'-0"
El. 520.0
See NOTE A below
Compacted random fill
50'-0"
Foundation cut-off
40'-0"
75'-0"
Start grout curtain at Sta. 8+60
5'-0"
20'-0"
2'-0" Rock slope protection
2'-0" Gravel bedding
Compacted pervious fill
Compacted impervious fill
10'-0" Compacted sand fill
10'-0"
Compacted sand fill
Foundation drain
20' from Sta. 6+50 to Sta. 8+50
25', or to bedrock, from Sta. 8+50 to Sta. 9+25
30' from Sta. 6+50 to Sta. 8+50
For detail of drain from Sta. 8+50 to Sta. 9+25 see Detail "A" this sheet.
10'-0"
25'-0"
2'-0"
2.5
3

SECTION AT STA. 6+90

(TYPICAL FROM STA. 6+50 TO STA. 9+25)

SCALE: 1" = 40'


Compacted pervious fill
Compacted impervious fill
Original ground surface
10'-0" Compacted sand fill
Compacted sand fill
Strip to suitable material
Assumed bedrock surface
Hand cleaned Bedrock surface
40'-0"
3'-0" Min Compacted gravel fill
2
1

DETAIL "A"

SCALE: 1" = 40'

NOTES:

Elevations refer to Mean Sea Level Datum.

For general notes applying to this sheet, see Sheet No. 2

Figures in hexagons indicate Item Nos. under which payment will be made.

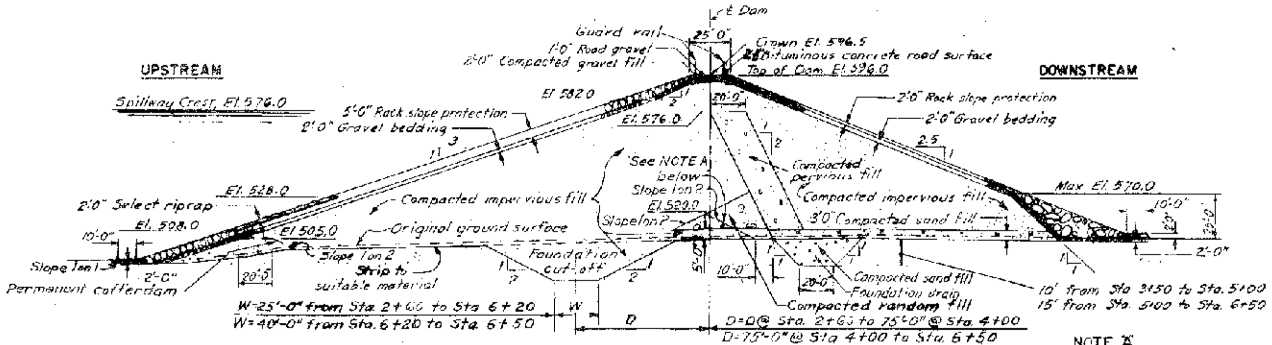
For detail of guard rail see Sheet No. 29

For detail of grout curtain see Sheet No. 26

Rock surface of bottom of foundation cut-off to be hand cleaned where foundation cut-off is extended to bedrock.

For elevations of bottom of foundation cut-off see profile on Sheet No. 28.

For dike embankment section and detail see Sheet No. 29



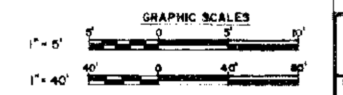
SECTION AT STA. 6+00

(TYPICAL FROM STA. 3+00 TO STA. 6+50)

SCALE: 1" = 40'

NOTE "A"

Limit for placement of compacted random fill and compacted impervious fill prior to placement of adjoining fills



REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY RH DR. BY K.H.W. CK. BY J.W.

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
EMBANKMENT SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, ... BRANCH

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE: AS SHOWN SPEC. NO. CIV ENG 19-016-62-49

DRAWING NUMBER
CT-1-5731

SHEET 25

Munn Brook Dam

- **Westfield**

Also see: Dam Report Section - Westfield.

City/Town	Westfield
Dam	Munn Brook Dam
Name	Berman, Munn

WESTFIELD
D21018

MUNN BROOK DAM

D21018

NO IMAGE ON FILE FOR THIS RECORD

(INFORMATION EXISTS ONLY ON A FILE CARD FROM THE OFFICE OF THE FORMER HAMPDEN COUNTY ENGINEER.)

Pallo Dam

1946 Westfield

Proposed interested in dam.

City/Town	Westfield
Dam	Pallo Dam
Name	Pallo, John

JOHN PALLO M. D.
97 ELM STREET
WESTFIELD, MASS.

February 27, 1946.

Hampden County Commissioners
Springfield, Mass.

Dear Mr. Tighe:—

Please send me information about making dams on brooks to impound water in a pond for fishing and swimming purposes. The idea I have in mind is to buy land on both sides of a brook and make a stone and earthen dam.

The location will be determined by all the factors involved.

(COPY)

March 4, 1946

John Pallo, M. D.
97 Elm Street
Westfield, Mass.

Dear Sir:

In answer to your letter of February 27th. relative to the construction of dams, I might say, that, according to the General Laws, (Ter. Ed.) Chap. 253, Sec. 44, plans and specifications for the construction of a dam for impounding water for any purpose, whether for the forming of a mill pond or a pleasure pond, must be approved by the County Commissioners, provided that any one of the three following conditions would exist after the structure was completed, namely:

(1) If the height of the dam would be ten feet or over above the streambed.

(2) If the pond formed by the dam, even though it was less than 10 feet in height, would have a capacity of a million of gallons or over.

(3) If the drainage area or watershed, contributory to the structure, was a square mile or over.

The fulfillment of any one of the above three conditions by the building of the dam, would require that plans and specifications for its construction be first approved by the County Commissioners.

As an example, if the dam were only say 9 feet or less in height, and the drainage area only a half a square mile, nevertheless, if the capacity of the pond formed was a million of gallons or over, plans and specifications would have to be approved by the County for the building of the structure. Plans and specifications would have to be approved, anyhow, no matter how small the structure or the pondage formed thereby might be, providing the drainage area or watershed contributory was a square mile or over.

It may not be out of place to state, that the authority of the County Commission extends only to the stability and safety of dams, and not to any damages done to abutting properties by high water caused by their construction.

Very truly yours,

James L. Tighe

Engineer

Parker Dam

- **Westfield**

Also see: Dam Report Section - Westfield.

City/Town	Westfield
Dam	Parker Dam

WESTFIELD
D21020

PARKER DAM

D21020

NO IMAGE ON FILE FOR THIS RECORD

(INFORMATION EXISTS ONLY ON A FILE CARD FROM THE OFFICE OF THE FORMER HAMPDEN COUNTY ENGINEER.)

Perez Dam

1965 Westfield

Complaint from Arthur Terry regarding sandbag dam built across Great Brook owned by Theodore Perez.

City/Town	Westfield
Dam	Perez Dam
Name	Terry, Arthur
Name	Perez, Theodore F
Water	Great Brook

July 28, 1965

Mr. Theodore F. Perez
Zephyr Drive
Westfield, Massachusetts

Dear Sir:

The County of Hampden has been notified by a Mr. Arthur Terry of Westfield of the existence of a sandbag dam across Great Brook on property situated upstream of the Terry property. Notification of the existence of this dam was filed with the County Hydraulic Engineer. An inspection of the site and the general immediate area of Great Brook was made by the County Hydraulic Engineer on Tuesday, July 20, 1965, and a report on the sandbag dam filed with our Board.

In accordance with Chapter 253 of the General Laws of the Commonwealth of Massachusetts, any dam constructed across Great Brook should have plans and specifications filed and approved by the County and then a Decree issued allowing the construction and operation of the approved dam before the structure is built.

It is our understanding that the dam has been constructed on property owned by you. This Board has no objection to you maintaining a small dam at this site provided it is built in a sound manner and in accordance with drawings and specifications filed with the County. If, for any reason, you have no desire to maintain a small dam at this site, it would be advisable for you to remove the sandbag dam that now exists.

The small pond of water that is formed by the sandbag dam is apparently used for swimming and wading purposes. Excavation of the swimming hole could result in the formation of a fairly deep pool without the necessity of forming a dam that would require the filing of plans and specifications.

If you have any question in connection with the requirements for building and maintaining dams within the Commonwealth of Massachusetts, please contact our Board or call the County Hydraulic Engineer, Mr. George H. McDonnell, at Holyoke 533-3991. We would be pleased to have him meet with you at the site, if you so desire, to explain the matter and law relating to the construction and operation of small dams.

Very truly yours,

Board of County Commissioners

____

____

____

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEfferson 3-3991

CD Westfield
August 31, 1965

The Hon. the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen:

Reference is made to my letter-report of July 26, 1965, regarding a complaint from Mr. Arthur Terry of Westfield relative to a sandbag dam built across Great Brook, a short distance upstream from his property. Your Board wrote to Mr. Theodore F. Perez, the owner of the property on which the sandbag dam had been constructed, and notified him that in order to maintain a dam on Great Brook it would be necessary to have the dam properly constructed in accordance with plans and specifications filed with your Board.

On Thursday, August 26, 1965, the undersigned examined the site of the small dam again and found that the breach on the right side of the sandbag dam was wider than previously noted and that the full flow of the brook passed thru the breach with little or no impounding of water. The left portion of the sandbag dam was still in place but when the undersigned walked across this portion of the dam, the sandbags were so rotted that the cloth of the bags disintegrated. It is apparent that these remaining bags will have little ability to withstand flood flows in the stream and they will be washed out, to some extent, resulting in a widening of the already formed breach.

At the location of the breach, there are a number of vertical sticks and some debris set into the bed of the brook but these do not impede the passage of water and, in time of heavy flood flow which can be expected either in the Fall of this year or the Spring of next year, these probably will be washed away.

The undersigned stopped at the home of Mr. Terry to discuss the present condition of the dam with him but did not find him at home.

Under Chapter 253 of the General Laws of the Commonwealth of Massachusetts, Sections 44 thru 50 inclusive, the following is quoted from the last sentence of Section 44.

> "This and the following six Sections shall not apply to small dams, constructed for irrigation or for other purposes, the breaking of which would involve no risk to life or property, nor to standpipes or tanks, nor to a dam where the area draining into the pond formed thereby does not exceed one square mile, unless the dam is more than 10 ft. in height above the natural bed of the stream at any point or unless the quantity of water which the dam impounds exceeds one million gallons."

Though the dam as existing when it was a complete, unbreached structure did not store a million gallons and was not 10 ft. in height, it was built across Great Brook at a point where the drainage area is much more than one square mile. As now existing, the dam impounds little or no water and the breach at the right side of the dam allows for the passage of the stream flow. In my opinion, Sections 44 thru 50 of Chapter 253 of the General Laws no longer applies to this dam. The reason being, that breaking of this dam which would consist simply of the widening of the breach involves no risk to life or property. Provided that the dam is not rebuilt, it is my opinion that no further action can be taken in connection with the complaint of Mr. Terry, under Chapter 253 of the General Laws, unless the breach in the dam is closed and the structure reactivated.

It is recommended that a second letter be sent to Mr. Perez advising him of the fact that the vertical sticks and debris in the breach of the dam should be removed and then the dam not reactivated by repairing the structure unless plans and specifications are filed and the dam built of proper and approved materials.

Respectfully submitted,

George H. McDonnell

George H. McDonnell
County Hydraulic Engineer

GHM/mb

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND *CONSULTING ENGINEERS*

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Westfield
July 26, 1965

The Hon. the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen:

The undersigned has received a complaint from a Mr. Arthur Terry of Westfield, relative to a sandbag dam built across Great Brook a short distance upstream from his property. Mr. Terry's property is located on the easterly side of an unimproved road that parallels Shaker Road in Westfield from a point just northerly of the Springfield aquaduct location to a point where Great Brook crosses under Shaker Road. Mr. Terry owns about an acre of land that lies between the unimproved road and Great Brook. On this land he has a house and a storage shed. The bank of Great Brook is relatively steep and the storage shed is located not too far back from the top of the brook bank.

Great Brook as it flows northerly to join Westfield River, follows a winding course and in passing by the Terry property, the brook sweeps against the left bank as it makes a gradual turn to the right.

A short distance upstream from the Terry property, on land of Perez, there is a swimming hole used by children apparently residing in the general immediate area and, to provide a depth of water suitable for swimming, stakes have been driven vertically into the bed of the brook and a sandbag dam with a sluiceway has been constructed across the brook. The sandbag dam is about 3 ft. in height above the bed of the brook.

On the day of inspection, Tuesday, July 20, I noted that bags had been removed from the right end of the dam to allow flow of the brook to pass thru the dam and as a result, water was not ponded to the elevation of the sluiceway thru the sandbag structure.

Mr. Terry complains about the presence of the dam because children release water suddenly from time to time, by removing some of the sand bags. It is also possible that in time of heavy storm runoff, bags are displaced by storm flow. This sudden increase in brook flow causes Mr. Terry concern in that the flow is generally concentrated against the toe of the bank at his property and he is fearful that erosion may eventually result in failure of the bank slope.

The undersigned examined the toe of the bank and did note that there is undercutting occurring. However, there is a fairly good network of roots in the soil and it is doubtful if any major failure of the embankment will take place as a result of released water from the dam in question. From the size of some of the trees growing in the embankment, it is apparent that no major failure of the slope has taken place for many years.

Regardless of whether or not there is a potential danger to the property of Mr. Terry by the presence of the sandbag dam upstream, the drainage area of Great Brook is such that any damming of the brook probably should only be done in accordance with filed and approved plans and specifications. The drainage area of Great Brook is many square miles and consequently, the section of Chapter 253 of the General Laws relating to size of drainage area controls in regard to the erection and maintenance of a dam across this stream.

Since there has been a complaint registered by Mr. Terry, it would seem to the undersigned that it is necessary to notify the owner of the property, Mr. Theodore Perez, on which the dam has been built that the dam should be removed, if he wishes to maintain a dam at this site, then plans and specifications of any proposed construction should be filed for approval of your Board.

Enclosed is a suggested communication that could be sent to the owner, Mr. Theodore F. Perez, if you concur in its contents.

Very truly yours,

George H. McDonnell

George H. McDonnell
County Hydraulic Engineer

GHM/mb

Sept. 1, 1965

Mr. Arthur Terry
Shaker Road
Westfield, Massachusetts

Dear Sir:

The County Hydraulic Engineer notified our Board in a letter-report dated July 26, 1965, about your complaint of a dam constructed across Great Brook just above your property in Westfield. We wrote to the Owner of the land on which the dam has been constructed, Mr. Theodore F. Perez, and informed him of the requirements regarding the construction and maintenance of dams as per Section 253 of the General Laws of the Commonwealth of Massachusetts.

The County Hydraulic Engineer made another inspection at the site of the dam on Thursday afternoon, August 26, 1965. At the time this inspection was made he stopped by your property but he did not find you there.

The small sandbag dam was found partially breached on August 26. The County Hydraulic Engineer reported to our Board that the right portion of the dam had been removed and the only objects remaining in this part of the bed of Great Brook were vertical sticks and stakes and some debris. We have written again to the owner of the property, Mr. Perez, and pointed out to him that these should be removed and then the breach in the dam should not be closed.

Since the County Hydraulic Engineer reports that the flow of the brook now can pass thru the breach in the dam without causing any problem or danger to persons and property downstream, and that the remaining sand bags are rotten and will slowly be washed away by normal water action, there is no further action that can be taken by our Board under the laws of the Commonwealth until such time as the dam should be reactivated and water ponded again.

The owner of the land has been advised that the dam cannot be rebuilt unless the provisions of Chapter 253 of the Laws of the Commonwealth are complied with.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

Shaker Rd.
Westfield, Mass.
Sept. 11, 1965

Board of County Commissioners
52 State Street
Springfield, Mass.

Dear Sirs:

I received your letter of the 1st, stating that Mr. Perez has been ordered to remove the sandbag dam in Great Brook,which presented a danger to my property.

I wish to express my appreciation that this step has been taken there, as I had reason to believe the procedure was without the proper authority. Further substantiating this fact, I was talking to one of Mr. Perez' employees, since Mr. McDonald's investigation, who informed me that Mr. Perez had nothing directly to do with the dam's being there, which very well confirms my theory it was only boys.

I would not have you think that I want to quell these children's enjoyment in any way, but feel that I must separate myself from this group allI can, due to the fact that, from what I heard,they got started as a neighborhood association holding what might be considered illicit drinking parties, yet, decent to their own customs and ways, but with an apparent later wave of a rougher class doubtless, trying to get in with the former group. The results of this latter gang I probably get, culminating usually with the racing of motorcycles and rattletrap cars up and down the right of way, which is rightfully mine according to the realestate company, the tongues of the operators rattling just as much as the ramshackle vehicles they are perched upon. This together with acts of vandalism isn't a very desirable addition to an otherwise quiet isolated home if that is all you get there,and not being reared to these ways,any fraternization would be hazardous because,in cases of social disaster the law does not consider equally for the two, so I favor the total abolition of this move.

If my calculation is correct,the good part of the association is gone,unless the entire tract could be taken over as a civic park. I suggested this to Mayor Martin because trolly service possibility reaching there via the old canal that runs through the area, the contour and bed of which are very adaptable to trackage would be easy.He said it was an idea,but nothing like that at present,so as far as I can see,there is absolutely nothing there.

Respectfully yours,

Arthur Terry

Sept. 1, 1965

Mr. Theodore F. Perez
Zephyr Drive
Westfield, Massachusetts

Dear Mr. Perez:

Reference is made to our communication of July 28, 1965, relative to a small sandbag dam built across Great Brook on property owned by you. The County Hydraulic Engineer has made a follow-up inspection at the site of this dam. This inspection was made on Thursday, August 26, 1965.

The County Hydraulic Engineer has informed our Board that a breach has been formed in the dam at the right side and that this breach is capable of passing the flow of the brook without impounding water to any great extent. However, in the breach, vertical sticks and stakes extend upward from the bed of the stream and there is some debris held back as the result of these sticks and stakes. They should be removed and the course of the brook thru the dam left open so that no water will be impounded.

If it is your desire to maintain a dam at this site, the dam can be built and maintained under the provisions of Chapter 253 of the General Laws of the Commonwealth of Massachusetts provided the dam is built in accordance with plans and specifications filed with the County of Hampden and construction is carried on in accordance with these plans and by making use of approved materials.

If the dam is being constructed by persons unknown to you, it is recommended that the structure be breached anytime that you find it closed and that you take whatever steps are necessary to prevent the reconstruction of the small dam on your property.

If you have any question in connection with this matter, please contact our Board or the County Hydraulic Engineer, Mr. George H. McDonnell, at Holyoke 533-3991.

Very truly yours,
BOARD OF COUNTY COMMISSIONER

RFD#2.,Off Shaker Rd.
Westfield,Mass.
Jan. 3, 1966

Hampden County
Board of Commissioners
52 State Street
Springfield, Mass.

Dear Sirs:

Some months ago, I entered a complaint against an illegal sandbag dam constructed in Great Brook on the Theodore Perez property,just upstream of mine, off Shaker Rd., Westfield, the dam presenting a danger to my property. The complaint was acknowledged, Mr Perez notified, and the dam was removed. The men operative in its construction apparently were tresspassers, because Mr. Perez was quoted as saying that he had nothing to do with its erection, and an association using the land as recreational area, had, at some time previous, disbanded.

A short while ago, I noticed the dam had been partially reconstructed(fully across stream,but not as high,that is), at such time, I reported it orally at your office, and it was suggested I write explaining the details. However, I find that since then, the dam has again been crudely removed, or washed out by recent storms.

This temporarily mitigates the danger, but presents evidence that someone is again trying to illegally enter that place. I might say at this point, that from what I heard, former groups of that sort culminated with unlawful behavior, such as, drunkenness, nudity, vandalism, etc.

These unruly and indecent things are detrimental to me, as I am selling land here, and in addition to hurting my present living conditions, serves hindrance to the possibility of a good buyer.

With these facts in view, I favor the total abolishion of the dam.

Yours very truly,

Arthur Terry

Arthur Terry

January 19, 1966

Mr. Arthur Terry
RFD #2, off Shaker Road
Westfield, Massachusetts

Dear Mr. Terry:

We acknowledge your communication of January 3, 1966.

The County Hydraulic Engineer has reviewed the case referred to in your communication and has made a report to our Board.

It is our opinion that under the provisions of Chapter 253 of the General Laws of the Commonwealth of Massachusetts, the County can take no action unless a dam is actually in existence and its condition is such as to endanger persons and property downstream. Endangering property does not mean detracting from the value of the property as described in the third and fourth paragraphs of your communication. Endangering your property would mean the danger of physically washing away your property as a result of a flood that could be caused by failure of the dam.

Based upon statements in your communication of January 3, 1966, and information supplied to our Board by the County Hydraulic Engineer, there is no provision in the Laws of the Commonwealth that gives us authority to assist you in your request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

July 20, 1966

Mr. Arthur Terry
R. F. D. #2 off Shaker Road
Westfield, Massachusetts

Dear Mr. Terry:

We have been informed by the County Hydraulic Engineer of your telephone complaint dated June 28, 1966, regarding a small dam built on Great Brook in Westfield just upstream from your property. The County Hydraulic Engineer has made an inspection in the field and noted the dam and conditions related to the dam. The County Hydraulic Engineer has reported to our Board and we have reviewed his report and the conditions existing at the site in question.

As reported to us by the County Hydraulic Engineer, the dam in question is very small in height, has been built mainly of debris and miscellaneous materials, and the quantity of water stored is extremely small. The dam is not sufficient in size nor does it store sufficient water whereby the dangers imposed by its existence are serious.

Based upon the information contained in the report of the County Hydraulic Engineer, there is no provision in the laws of the Commonwealth, particularly in Chapter 253 of the General Laws to give our Board authority to direct that the small dam be removed. In the past, our Board wrote to the owner of the land on which the dam has been built and advised him that if the dam is being constructed and reconstructed by persons unknown, steps should be taken to prevent the continued existence of the dam. However, as mentioned hereinabove, the law, in this case, does not allow our Board to take positive action as per your request.

The matter could probably best be worked out by mutual agreement between yourself and the property owner involved.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

RFD#2, off Shaker Rd.
Westfield, Mass.
July 27, 1966

Hampden County Commissioners
52 State Street
Springfield, Mass.

Dear Sirs:

I am replying to your letter of the 20th, informing me that the small dam in Great Brook just above my property is not hazardous, of which I am relieved to know, but that an agreement might be reached between the landowner there and me.

When the trouble first started, I tried to get a satisfactory agreement here, but upon seeking information of some, the police were summoned, that they didn't want me around. At the time, the officer advised me, that in any future difficulty, not to go to them, but report to the authorities, which I have done.

This would eliminate any mutual agreement legally, and the incident also shows up a phase of guilt on their part that would inhibit agreement from a psychological standpoint, as I understand the present users are only an aftermath of an association fomerly using the area, with a legitimate reason to be there, the present users becoming only drunk, indecent, and obscene, acting like statues, having no feeling, nor conscience either, but apparently attractive enough to some, to win them sufficient favor civically, that there would be no equal, or considerate relationship in the minds of any of them for the average individual, and police opinion, in this case, tends to protect their guilt, in order to get rid of me, I suppose.

Under this social setup, I can see no chance of any kind of mutuality, with a deliberate, and forced division of society, of which, under the nauseating circumstances, I would as soon it be.

I should think this situation would necessitate modification by civil authority, were the circumstance perilous enough.

Very respectfully yours,

Arthur Terry

Arthur Terry

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEfferson 3-3991

CD Westfield
July 14, 1966

The Honorable the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen:

In 1965, from time to time, the undersigned received complaints from a Mr. Arthur Terry of Westfield, relative to a small dam built on Great Brook for the purpose of forming a small wading and swimming pond.

In my last communication to your Honorable Board on this subject matter dated January 12, 1966, I pointed out on Page 2 of the letter as follows:

> "From what I have seen of the dams on the site in question during three or more inspections during 1965, none of the structures were large enough to be classed as dams that could result in endangering persons and property downstream. Consequently, it is my opinion that your Honorable Board cannot take any action in this case."

On January 19, 1966, your Board wrote to Mr. Terry and pointed out to him that under the provisions of Chapter 253 of the General Laws of the Commonwealth, you had no power to act on his complaint.

On July 8, 1966, I again examined the location on Great Brook where the small dam in question was found to be in existence. The dam is not over 18" in height and has been constructed with debris, logs and sandbags. It forms a small pool about 50 ft. in diameter and probably no more than 3 ft. deep at its deepest point. The quantity of water ponded is no more than a few thousand gallons at best. Should heavy storm runoff occur and the small dam be breached, the amount of water stored would be so insignificant its effect could not be physically noted downstream.

There has been considerable disturbance on the surface of the ground to the left of the dam and immediately downstream. This disturbance is a result of surface runoff taking place directly over what appears to be a storm drainage pipeline. The surface runoff, which incidentally has no relation whatsoever with the small dam in question and with Great Brook, has caused the formation of a gulley and has even exposed a portion of the drain pipe. Sand washed to form the gulley has been discharged into the bed of the stream.

It is recommended that Mr. Terry's complaint be acknowledged and that he again be notified that your Board has no authority to act in connection with his complaint.

A suggested form of communication to Mr. Terry is included herewith for your consideration.

Very truly yours,

George H McDonnell

George H. McDonnell
County Hydraulic Engineer

GHM/mbf

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Westfield
January 12, 1966

The Hon. the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen:

I have received the copy of the letter sent to your Board by Arthur Terry of Westfield, Massachusetts, relative to the small dam on Great Brook upstream of his property.

In my letter to your Honorable Board dated August 31, 1965, I pointed out that in my opinion, the provisions of Chapter 253 of the General Laws of the Commonwealth relative to dams was not applicable in that the small dam existing at that time did not result in endangering the lives of persons downstream nor threaten damage to property below.

Mr. Terry states that a short while ago the dam had been partially reconstructed and that since that time, it has been either crudely removed or washed out.

The main complaint of Mr. Terry seems to be centered around persons illegally entering property which he does not own and heresay behavior of people making use of the brook in the vicinity of the dam.

Mr. Terry goes on to state that "These unruly and indecent things are detrimental to me, as I am selling land here, and in addition to hurting my present living conditions, serves hindrance to the possibility of a good buyer".

At the termination of his communication, Mr. Terry requests the total abolition of the dam.

The owner of the property involved, Mr. Theodore Perez, has told me that he has not built the improvised dam across Great Brook on his property, and that insofar as he knows, young folks making use of the woods and the stream form a small pool for recreational purposes by constructing a dam with sand bags and debris material.

From what I have seen of dams on the site in question during three or more inspections in 1965, none of the structures were large enough to be classed as dams that could result in endangering persons and property downstream. Consequently, it is my opinion that your Honorable Board cannot take any action in this case.

The action needed apparently is the policing of the area if illegal actions are being taken by persons frequenting the site.

Enclosed is a suggested form of communication that could be sent to Mr. Terry if you concur in its contents.

Very truly yours,

George H McDonnell
George H. McDonnell
County Hydraulic Engineer

GHM/mbf

Enc.

Pieczarka Realty Dam

- **Westfield**

Also see: Dam Report Section - Westfield.

City/Town	Westfield
Dam	Pieczarka Realty Dam
Name	Pieczarka Realty Inc
Name	Kulper, J G

WESTFIELD
D21022

PIECZARKA REALTY INC. DAM

D21022

NO IMAGE ON FILE FOR THIS RECORD

(INFORMATION EXISTS ONLY ON A FILE CARD FROM THE OFFICE OF THE FORMER HAMPDEN COUNTY ENGINEER.)

Powder Mill Brook Watershed

1959 Westfield

Powermill Brook orginates in the Town of Montgomery and flows southeasterly for 8.5 miles through the City of Westfield to its confluence with the Westfield River. Major tribuaries are Arm Brook and Sandy Mill Brook. See also: Dam Report Section - D25017; D25018 & D25107. See also: County Roads Plan #29 & #30 "Powder Mill Brook Multiple Purpose Dam" & "Powder Mill Detention Dam".

City/Town	Westfield
Water	Westfield River
Water	Powder Mill Brook Watershed
Water	Powder Mill Brook
Water	Arm Brook
Water	Sandy Mill Brook

OFFICE OF THE MAYOR
CITY OF WESTFIELD
MASSACHUSETTS

JOHN DAVID O'CONNOR
MAYOR

September 27, 1960
SP

County Commissioner William Stapleton
Hampden County
37 Elm Street
Springfield, Massachusetts

Dear Bill:

We have received a copy of the "Report of Preliminary Investigation of the Powdermill Brook Watershed" by the United States Department of Agriculture Soil Conservation Service, Amherst, Mass. This is in regards to Flood Control Dams under authority of the Flood Prevention and Watershed Protection Act, Public Law 566.

This application covers the entire watershed of the Powdermill Brook, an area of 12,825 acres. The major portion of this lies in Hampden County and includes parts of the Cities of Westfield, Holyoke, West Springfield and the Town of Montgomery. Powdermill Brook originates in the Town of Montgomery and flows southeasterly for 8.5 miles through the City of Westfield to its confluence with the Westfield River. Major tributaries are Arm Brook and Sandy Mill Brook.

Would it be possible for Hampden County to be a co-sponsor of this Project? Any suggestions you might offer in regards to this proposed Flood Control Plan would be greatly appreciated.

Sincerely yours,

John

JOHN DAVID O'CONNOR
Mayor

**Received in afternoon mail on
September 28, 1960.**

**Copy of this letter sent to George H. McDonnell,
County Hydraulic Engineer, on Sept. 29, 1960.**

asking funds from
City per [illegible]
11/9/60

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Westfield
Oct. 3, 1960

The Hon. the Board of County Commissioners
Hampden County Court House
37 Elm Street
Springfield, Mass.

Gentlemen:

I have received the copy of the communication sent to me by your Board pertaining to the request of the Mayor of Westfield for assistance from Hampden County on the flood control project as being studied for Powdermill Brook Watershed.

I have written to the Dept. of Agriculture, Soil Conservation Service, for a copy of the report on this project in order that I may be able to advise your Board in regard to planned dam construction.

I would suggest that for the present, you notify the Mayor of Westfield that you are going to look into the proposed flood control project and will advise him of any aid or assistance that your Board or the County might be able to offer.

Very truly yours,

Geo H McDonnell

George H. McDonnell
County Hydraulic Engineer

GHM/mb

CD Westfield
Oct. 3, 1960

The Hon. the Board of County Commissioners
Hampden County Court House
37 Elm Street
Springfield, Mass.

Gentlemen:

I have received the copy of the communication sent to me by your Board pertaining to the request of the Mayor of Westfield for assistance from Hampden County on the flood control project as being studied for Powdermill Brook Watershed.

I have written to the Dept. of Agriculture, Soil Conservation Service, for a copy of the report on this project in order that I may be able to advise your Board in regard to planned dam construction.

I would suggest that for the present, you notify the Mayor of Westfield that you are going to look into the proposed flood control project and will advise him of any aid or assistance that your Board or the County might be able to offer.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

Oct. 5, 1960

Hon. John David O'Connor, Mayor
City of Westfield
Municipal Building
Westfield, Mass.

Dear Mayor O'Connor:

In connection with your communication of Sept. 27, 1960 pertaining to your request for Hampden County to be a co-sponsor of the proposed flood control project for Powdermill Brook Watershed, we will investigate this matter and advise you as soon as possible, of any aid and support we may be able to provide.

As you know, County funds are not available under a general program for the sponsoring and assistance in flood control work as they are in connection with roadway maintenance and construction. As soon as we have had an opportunity to investigate all possible factors in connection with your proposed request, we will then contact you again. We have instructed the County Hydraulic Engineer and the County Attorney to report to us on the project as being proposed and studied.

Sincerely,

BOARD OF COUNTY COMMISSIONERS

____

____

____

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE
& BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Westfield
Oct. 24, 1960

The Hon. the Board of County Commissioners
Hampden County Court House
37 Elm Street
Springfield, Mass.

Gentlemen:

Reference is made to the copy of the communication sent to me pertaining to the inquiry from the Mayor of Westfield regarding assistance from the County in carrying thru to a successful conclusion the proposed flood control measures for the Powdermill Brook watershed. I have obtained a copy of the report on this project entitled "Report of Preliminary Investigation of the Powdermill Brook Watershed, Hampden & Hampshire Counties, Massachusetts, by the U.S. Dept. of Agriculture, Soil Conservation Service, Amherst, Mass." The report has been prepared under authority of the Flood Prevention and Watershed Protection Act, Public Law 566, and the report is dated Sept., 1960.

The report is very preliminary in nature and points out that the watershed involved covers an area of about 12,825 acres. The major portion of the watershed lies in Hampden County, with approximately 925 acres being in Hampshire County. The area involved includes parts of the cities of Westfield and Holyoke, as well as parts of the Towns of West Springfield, Montgomery and Southampton.

Powdermill Brook originates in the Town of Montgomery and flows southeasterly for a distance of about 8.5 miles, thru the City of Westfield, to where it discharges into the Westfield River. Two major tributaries join Powdermill Brook. One is Arm Brook situated to the north of the central section of Westfield, and the other is Sandy Mill Brook to the north and east of the central section of Westfield.

The purpose of the investigation was to determine the feasibility of installing work of improvement for flood protection and to provide the people involved with a basis for making decisions relative to the desirability of proceeding further with the proposed project.

The report points out that as a result of the flood of August, 1955, flood damages of $688,000 occurred in the watershed. These damages were broken down as follows:

Agricultural	$70,000
Industrial	396,500
Residential	200,000
Utilities, including roads & bridges	21,500

The flood prevention work would include land treatment measures as well as the construction of two flood water retarding structures. These would be flood control dams which would impound water in time of heavy storm run-off. The water would be released following the storm run-off conditions. One of the two structures involved would be located on Powdermill Brook just west of the NY, NH & H Railroad and east of Montgomery Road at a point just south of the Mass. Turnpike. The other structure would be on Arm Brook approximately 500 ft. north of the Mass. Turnpike. The two flood control dams and reservoirs would control excessive run-off from approximately 8 square miles. This represents about 90% of the drainage area of Powdermill Brook above the North Elm Street area of Westfield.

The report points out that the two flood water retarding dams and ponds recommended would eliminate future damages in the vicinity of No. Elm Street in Westfield from storms that could occur up to and greater than once in 100 years. There would be additional benefits accrued to areas further downstream now subjected to flood water damages from Powdermill Brook. In addition to flood protection, the flood water structure on Arm Brook could be designed and constructed to provide for fish, wildlife, general recreation and other community uses.

The estimated cost of the flood control structures is $250,000, broken down as follows:

1. Construction and installation	$216,500
2. Land easements and rights-of-way	32,000
3. Administrating Contract	1,500

The average annual flood prevention benefit from the structural works of improvement is estimated at $13,400. The average annual cost of these structures is estimated at $9,815. Thus, the benefit cost ratio is 1.4 to 1.0.

The summary section of the report states as follows: "Two flood water retarding structures are recommended for further study. The total Federal cost of these structures is estimated at $216,500. The local Organization's share of installation costs, which would be for easements, rights-of-way and administrating

Contracts, is estimated at $33,500. The local Organization's annual cost of operating and maintaining the structural works of improvement is estimated at $1,000.

The Soil Conservation Service desires satisfactory assurance that the local Organization is willing and able to assume its responsibilities as outlined in this report before proceeding with further studies. When this assurance is received, the Soil Conservation Service will give this watershed a high priority in the preparation of a final work plan for watershed protection and flood prevention under Public Law 566."

From the information contained in the report, it would appear as if the major costs for the proposed flood control system would be borne by the Federal Government and that land treatment measures as well as a cost of about $33,500 would of necessity be borne locally.

From a hydraulic and engineering viewpoint, the information as set forth in the preliminary report indicates that further studies of the two proposed flood control structure sites are desirable and advisable. I am of the opinion that once the Soil Conservation Service receives assurance that the costs as set forth as the responsibility of the local Organization are agreed to, further engineering studies of the project will proceed so that the final working plans and specifications can be prepared.

Though there is no direct aid that apparently would be available for the City of Westfield thru the County in connection with the construction of the dams and flood control structures, the report indicates that the cost thereof would be borne entirely by the Federal Government and thus no local problem of financing would face the City other than assisting the local Organization with the necessary land acquisitions, etc. As of the moment, it would appear as if the only tangible help you could give Westfield would be to offer to support the project at any future meetings or hearings and to provide data and information available in your files and in those of your County Hydraulic Engineer.

The information outlined hereinbefore could be provided the Mayor of Westfield in letter form or, if your Board wishes, a meeting with the Mayor could be set up, wherein the matter of supporting the flood control project could be discussed.

The undersigned will be pleased to assist you in any way or to meet with the Mayor, as per your instructions, to outline the general information contained herein.

Respectfully submitted,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

COPY

CD Westfield
Oct. 31, 1960

Hon. John David O'Connor,
Mayor, City of Westfield
Municipal Building
Westfield, Mass.

Dear Mayor O'Connor:

Reference is made to the communication sent to the County Commissioners of Hampden County pertaining to the possibility of County assistance in carrying thru to a successful conclusion the proposed flood control measures for the Powdermill Brook watershed. The County Commissioners have asked me to look into the proposed flood control program and to contact you in connection therewith.

I obtained a copy of the report on this project entitled "Report of Preliminary Investigation of the Powdermill Brook Watershed, Hampden & Hampshire Counties, Massachusetts, by the U.S. Dept. of Agriculture, Soil Conservation Service, Amherst, Mass." The report has been prepared under authority of the Flood Prevention and Watershed Protection Act, Public Law 566, and the report is dated Sept., 1960.

The report is very preliminary in nature and points out that the watershed involved covers an area of about 12,825 acres. The major portion of the watershed lies in Hampden County, with approximately 925 acres being in Hampshire County. The area involved includes parts of the Cities of Westfield and Holyoke, as well as parts of the Towns of West Springfield, Montgomery and Southampton.

Powdermill Brook originates in the Town of Montgomery and flows southeasterly for a distance of about 8.5 miles, thru the City of Westfield, to where it discharges into the Westfield River. Two major tributaries join Powdermill Brook. One is Arm Brook situated to the north of the central section of Westfield, and the other is Sandy Mill Brook to the north and east of the central section of Westfield.

The purpose of the investigation was to determine the feasibility

COPY

of installing works of improvement for flood protection and to provide the people involved with a basis for making decisions relative to the desirability of proceeding further with the proposed project.

The report points out that as a result of the flood of August, 1955, flood damages of $688,000 occurred in the watershed. These damages were broken down as follows:

Agricultural	$70,000
Industrial	396,500
Residential	200,000
Utilities, including roads & bridges	21,500

The flood prevention work would include land treatment measures as well as the construction of two flood water retarding structures. These would be flood control dams which would impound water in time of heavy storm runoff. The water would be released following the storm runoff conditions. One of the two structures involved would be located on Powdermill Brook just west of the NY, NH & H Railroad and east of Montgomery Road, at a point just south of the Mass. Turnpike. The other structure would be on Arm Brook approximately 500 ft. north of the Mass. Turnpike. The two flood control dams and reservoirs would control excessive runoff from approximately 8 square miles. This represents about 90% of the drainage area of Powdermill Brook above the North Elm Street area of Westfield.

The report points out that the two flood water retarding dams and ponds recommended would eliminate future damages in the vicinity of No. Elm Street in Westfield from storms that could occur up to and greater than once in 100 years. There would be additional benefits accrued to areas further downstream now subjected to flood water damages from Powdermill Brook. In addition to flood protection, the flood water structure on Arm Brook could be designed and constructed to provide for fish, wildlife, general recreation and other community uses.

The estimated cost of the flood control structure is $250,000, broken down as follows:

1.	Construction and installation	$216,500
2.	Land easements and rights-of-way	32,000
3.	Administrating Contract	1,500

The average annual flood prevention benefit from the structural works of improvement is estimated at $13,400. The average annual cost of these structures is estimated at $9,815. Thus, the benefit cost ratio is 1.4 to 1.0.

The summary section of the report states as follows: "Two flood water retarding structures are recommended for further study. The total Federal cost of these structures is estimated at $216,500. The local Organization's share of installation costs, which would be for easements, rights-of-way and administrating Contracts, is estimated at $33,500. The local Organization's annual cost of operating and maintaining the structural works of improvement is estimated at $1,000.

The Soil Conservation Service desires satisfactory assurance that the local Organization is willing and able to assume its responsibilities as outlined in this report before proceeding with further studies. When this assurance is received, the Soil Conservation Service will give this watershed a high priority in the preparation of a final work plan for watershed protection and flood prevention under Public Law 566."

From the information contained in the report, it would appear as if the major costs for the proposed flood control system would be borne by the Federal Government and that land treatment measures, as well as a cost of about $33,500 would of necessity be borne locally.

From a hydraulic and engineering viewpoint, the information as set forth in the preliminary report indicates that further studies of the two proposed flood control structure sites are desirable and advisable. I am of the opinion that once the Soil Conservation Service receives assurance that the costs as set forth as the responsibility of the local Organization are agreed to, further engineering studies of the project will proceed so that the final working plans and specifications can be prepared.

The undersigned would be pleased to meet with your Honor to discuss the proposed flood control project and any aid and support that might be given Westfield by the Commissioners of Hampden County and the undersigned acting as their County Hydraulic Engineer. I would be pleased to meet with you at a time and day convenient to you. Data and information available in County files and in the files of the undersigned could be used as necessary to assist in carrying out the program to a successful conclusion.

If you wish to have me meet with you in Westfield, and if I happen to be out when you call, please leave any message with the secretary pertaining to a day and hour for a conference on the Powdermill Brook flood control project.

Very truly yours

George H. McDonnell
County Hydraulic Engineer

GHM/cmb

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Westfield

Oct. 31, 1960

The Hon. the Board of County Commissioners
Hampden County Court House
37 Elm Street
Springfield, Mass.

Gentlemen:

Enclosed for your information and file purposes, please find a copy of a communication sent to Mayor O'Connor of Westfield in regard to his request for assistance from the County on the flood control project as proposed for Powdermill Brook. The contents of my letter to the Mayor are self-explanatory. I will meet with the Mayor, at his convenience, and point out to him whatever aid can be provided to help carry the flood control program to a successful conclusion.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND *CONSULTING ENGINEERS*

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Westfield
Nov. 17, 1960

The Hon. the Board of County Commissioners
Hampden County Court House
37 Elm St.
Springfield, Mass.

Gentlemen:

The following is a brief report on my meeting with Mayor John O'Connor of the City of Westfield on Monday, Nov. 7, 1960, in connection with the proposed flood control program on Powdermill Brook Watershed. On Oct. 24, 1960, I submitted a general review of the report of the preliminary investigation of the Powdermill Brook Watershed as prepared by the U. S. Dept. of Agriculture, Soil Conservation Service, in Amherst, Mass. In this communication I pointed out that the estimated cost of the flood control system would be $250,000 more or less with a breakdown of this cost as follows:

1. construction and installation of facilities	$216,500
2. land easements and rights-of-way	32,000
3. administrating contract	1,500
Total	$250,000

It is my understanding that the Federal appropriation for Item 1 above would be for the entire construction and installation work. The local organization would be required to provide funds under Item 2 and Item 3. Thus, the total cost to be supported locally would be about $33,500.

The area involved is the watershed of Powdermill Brook and its tributaries. The area includes portions of Westfield, Holyoke, West Springfield, and Montgomery in Hampden County. Though four Hampden County communities are included in the drainage area, two of these communities are upstream of the flood control facilities and, consequently, would receive no particular benefit from the proposed construction. Westfield would receive the major benefit, while the Town of West Springfield would receive a minor benefit, since the flood discharge from Powdermill Brook is added to the flood discharge of Little River, as well as that of Westfield River, all of which pass thru the West Springfield area. The extra flood flow from Powdermill

Brook would make but a minor increase in flood conditions as compared to flood flows from the other two major streams.

The Mayor of Westfield wishes to have the County assist, if possible, in contributing a share of the local cost of $33,500. It is possible that this cost may be reduced and, if 50% of the cost could be borne by the County, this might represent an expenditure of County Funds equal to about $10,000 to a maximum of $15,000.

I pointed out to the Mayor that I knew of no funds available for such a purpose unless some special appropriation was provided. The undersigned pointed out that engineering services would be available in connection with the proposed work. Although the Conservation Service, together with other departments of the U. S. Government, would provide all engineering needed in designing the flood control facilities, the County Hydraulic Engineer would no doubt review the design and report to your Board in connection therewith.

If I can be of any further service in connection with this project, I will be pleased to meet with the Mayor or his respresentatives.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/f

WATERSHED WORK PLAN
FOR
WATERSHED PROTECTION AND FLOOD PREVENTION

POWDERMILL BROOK WATERSHED
Hampden and Hampshire Counties, Massachusetts

Prepared Under the Authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666) as amended.

Prepared by:
Hampden Soil Conservation District
and
City of Westfield

With Assistance by:
U. S. Department of Agriculture, Soil Conservation Service
U. S. Department of Agriculture, Forest Service

August 1961

TABLE OF CONTENTS

Page

SECTION 1 - THE WATERSHED WORK PLAN 1

SUMMARY OF PLAN 1
  Land Treatment Measures 2
  Structural Measures 2
  Damages and Benefits 3
  Provisions for Financing Installation of Structures 3
  Operation and Maintenance 3

DESCRIPTION OF THE WATERSHED 4
  Physical Data 4
  Topography 4
  Geology 4
  Soils 4
  Climate 5
  Land Use 5
  Economic Data 6

WATERSHED PROBLEMS 7
  Floodwater Damage 7
  Erosion Damage 7
  Sediment Damage 7
  Problems Relating to Water Management 7

EXISTING AND PROPOSED WORKS OF IMPROVEMENT 9

WORKS OF IMPROVEMENT TO BE INSTALLED 10
  Land Treatment Measures 10
    Cropland and Pasture Practices 10
    Forestry Practices 11
  Structural Measures 12
  Figure 1 - Project Map Follows page 40
  Table 1 - Estimated Installation Cost 13b

BENEFITS FROM WORKS OF IMPROVEMENT 14

COMPARISON OF BENEFITS AND COSTS 15

ACCOMPLISHING THE PLAN 16
  Land Treatment Measures 16
  Structural Measures 17

PROVISIONS FOR OPERATION AND MAINTENANCE 19
  Land Treatment 19
  Structural Measures 19

Page

COST SHARING 20

CONFORMANCE OF PLAN TO FEDERAL LAWS AND REGULATIONS 22

SECTION 2 - INVESTIGATIONS, ANALYSES, SUPPORTING TABLES AND MAPS 23

LAND TREATMENT MEASURES 23

HYDRAULICS AND HYDROLOGY 24
- General 24
- Frequency Data 24
- Evaluation Routings 24
- Key Storm Routings 25
- Rating Curves 25
- Evaluation 26
- Structures 26

ECONOMICS 27
- Damage Appraisals 27
- Evaluation 27
- Cost Allocation 28
- Land, Easements and Rights-of-Way 29

GEOLOGY 30
- Structure Site Investigations 30
- Sediment and Erosion Studies 30

STRUCTURE INVESTIGATION 31
- Floodwater Retarding and Multiple Purpose Structures 31
  - Principal Spillways 31
  - Emergency Spillways 31
  - Field Surveys 31

Page

TABLES

Table 2 - Estimated Structure Cost Distribution 32
Table 3 - Structure Data - Floodwater Retarding Structures 33
Table 4 - Summary of Physical Data 34
Table 5 - Summary of Plan Data 35
Table 6 - Annual Costs 36
Table 7 - Monetary Benefits from Structural Measures 37
Table 8 - Benefit-Cost Analysis 38
Table 9 - Allocation of Installation Costs of Structural Measures 39
Table 10 - Benefits from Works of Improvement by Reaches 40

SECTION 1

WATERSHED WORK PLAN

POWDERMILL BROOK WATERSHED

Massachusetts

SUMMARY OF PLAN

The Powdermill Brook Watershed drains 12,825 acres, of which 11,900 acres are in Hampden County and 925 acres in Hampshire County. All of the floodwater damages and all works of improvement included in this work plan are located in Hampden County.

The sponsoring local organizations are the Hampden Soil Conservation District and the City of Westfield.

This plan was developed jointly by the Soil Conservation Service, the U. S. Forest Service, the Hampden Soil Conservation District, and the City of Westfield. Other state and Federal agencies contributing to the plan were: Massachusetts Water Resources Commission, Massachusetts Division of Fisheries and Game, the U. S. Fish and Wildlife Service, and the U. S. Army Corps of Engineers.

Records indicate that floods causing serious damage occur about once in 12 years. Some damage to agricultural land in the flood plain is experienced more frequently. The largest flood of record occurred August 18-19, 1955. In this storm 19.8 inches of rainfall fell on the watershed in 34 hours. Runoff resulting from this storm caused direct floodwater damages of $820,150.

The plan includes conservation land treatment measures for watershed protection, one floodwater retarding structure, and one multiple purpose floodwater retarding-fish and wildlife enhancement structure.

The works of improvement are to be installed in a five-year period at a total estimated installation cost of $470,176. The share of this cost to be borne by Public Law 566 funds is $282,073. The balance of $188,103 will be borne by other funds.

Land Treatment Measures

The cost of land treatment is estimated at $153,214, of which $138,214 will be borne by other funds. Public Law 566 funds in the amount of $15,000 will be used entirely for accelerated technical assistance. This sum consists of $8,700 for use of the U. S. Forest Service, and $6,300 for use of the Soil Conservation Service.

Structural Measures

A floodwater retarding structure will be built on the Powdermill Brook. The Arm Brook structure is a multiple purpose floodwater retarding-fish and wildlife enhancement structure. These two structures control runoff from a total of 5,076 acres of the watershed. They provide for 1,547 acre-feet of floodwater storage, 142 acre-feet of permanent storage for fish and wildlife enhancement, and 23 acre-feet of sediment storage.

The total estimated installation cost of these two structures is $316,962, of which $284,917 is allocated to flood prevention and $32,045 to fish and wildlife enhancement. Of the total installation cost Public Law 566 funds will bear $267,073. The local share of installation costs will be $49,889. The following table shows how the installation costs are prorated:

Installation Item	P. L. 566 Funds		Other Funds		Total
	Flood Prevention	Fish & Wildlife Enhancement	Flood Prevention	Fish & Wildlife Enhancement	
Construction	186,273	8,645	--	12,354	207,272
Installation Services	64,778	7,377	--	--	72,155
Administering Contracts	--	--	1,863	210	2,073
Land, Easements & Rights-of-Way	--	--	32,003	3,459	35,462
Totals	251,051	16,022	33,866	16,023	316,962

The Massachusetts Division of Fisheries and Game will provide materials and personnel to practice fish and wildlife management at the Arm Brook site. Provisions for public access to this site will be included in the acquisition of land, easements and rights-of-way.

Damages and Benefits

The estimated average annual floodwater damage in the watershed from Powdermill Brook under present conditions is $19,156. The future average annual damages with the project installed is estimated to be $175.

The average annual flood prevention benefit from land treatment measures is $1,399 and from structural measures is $17,582. The estimated average annual flood prevention cost of these structures is $11,360. This results in a benefit-cost ratio of 1.5 to 1. In addition, public benefits will be derived from the use of the fish and wildlife enhancement pool. These latter benefits were not evaluated monetarily.

Provisions for Financing Installation of Structures

The City of Westfield will be responsible for obtaining all necessary land, easements and rights-of-way. This cost is estimated at $35,462. The city will also pay the local construction cost allocated to fish and wildlife enhancement in the Arm Brook structure estimated at $12,354.

The City of Westfield will be responsible for administering the contracts for installation of structural measures.

Construction costs for flood prevention ($186,273) and the Federal share for fish and wildlife enhancement ($8,645) will be paid from Public Law 566 funds. Public Law 566 funds will also bear the cost of installation services ($72,155).

Operation and Maintenance

Land treatment measures will be installed, operated, and maintained by local landowners and operators under agreements with the Hampden Soil Conservation District.

The City of Westfield will be responsible for operation and maintenance of the structural measures. This cost is estimated at $1,200 annually. Funds for this will be provided through appropriations by the city.

DESCRIPTION OF THE WATERSHED

Physical Data

The Powdermill Brook Watershed has a drainage area of 12,825 acres (20.04 square miles) all within the Commonwealth of Massachusetts. The major portion of the watershed lies in Hampden County with only 925 acres in Hampshire County. The area includes parts of the Cities of Westfield, Holyoke, and West Springfield and the Town of Montgomery in Hampden County, and the Town of Southampton in Hampshire County.

Powdermill Brook originates in the Town of Montgomery and flows southeasterly approximately eight and five-tenths (8.5) miles through the City of Westfield to its confluence with the Westfield River. Major tributaries are Arm Brook and Sandy Mill Brook.

Topography

The Powdermill Brook Watershed lies within the Central Connecticut Valley between the eastern and western highlands. This area has been over-ridden by glaciers. Upland swamps, ponds, drumlins and terraces are very common throughout. Topographic extremes are found, varying from gentle terrain in the lower portion to steep sided V-shaped valleys in the upper reaches of Powdermill Brook. The maximum elevation in the headwaters is 940 feet and the minimum elevation is 120 feet.

Geology

The watershed is covered by a mantle of unconsolidated Pleistocene glacial deposits underlain by Triassic sandstones. Glacial till has been deposited in the form of drumlins and moraines. It varies from a few feet to several hundred feet in thickness and consists of silt, sand, gravel and boulders. Stratified deposits include both fine lacustrine deposits and coarse outwash materials. Some of these are covered by a mantle of water deposited sands and gravels. Glacial till probably underlies many of the stratified deposits.

Soils

Upland soils occupy about 30% of the watershed. Terrace soils occupy 60% of the watershed. The remainder consists of recent alluvium, mucks, peats, and miscelleanous deposits of wind blown material.

The deep upland soils are derived from loose to very compact till. The principal well-drained series are Cheshire, Paxton, and Charlton. The shallow to bed rock soils belong to the Hollis and Sunderland series. Textures of these soils vary from loam to sandy loam.

The terrace soils are derived from stratified glaciofluvial deposits. The principal series are Merrimac, Agawam, and Hartford. Fine sandy loam and sandy loam are the predominant surface textures with sand and gravel subsoils. Large deposits of peat are to be found.

The principal soils in the flood plain are the Podunk and Rumney series and are frequently flooded. Surface textures of these soils are predominantly silt loams and very fine sandy loams. The drainage of these soils and their associated series ranges from moderately well drained to poorly drained. Deposits of peat and muck occur in this flood plain.

Climate

Average annual precipitation on the watershed is 47 inches. It is generally uniformly distributed throughout the year. Most of the precipitation during the winter season is in the form of snow.

Annual runoff from the watershed averages 23 inches. Spring runoff causes some annual flooding but major flooding is usually associated with storms of tropical origin.

The average growing season is from April 30 to October 13, 166 days.

Land Use

The major uses of land within the watershed are:

1. Woodland	8,055 acres - sixty-three percent
2. Cropland	1,635 acres - thirteen percent
3. Grassland	1,155 acres - nine percent
4. Urban	874 acres - seven percent
5. Water	260 acres - two percent
6. Other	846 acres - six percent

Second-growth hardwoods, mostly northern hardwoods and mixed oak types, occupy 62 percent of the forest area; white pine, pitch pine, and hemlock, 15 percent; and the remaining 23 percent mixed stands.

Economic Data

Approximately 12,000 people reside within the watershed. Population projections, as furnished by the Massachusetts Department of Commerce, predict that by the year 2000 there will be an increase of 61 percent.

There are approximately 325 acres in the flood plain of the Powdermill Brook and its tributaries. This represents two and one-half percent of the total watershed area. The flood plain land is used principally for agricultural, industrial and residential purposes.

There are 110 farms within the watershed averaging 65 acres and having an average value of $26,315. Major crops grown are vegetables, dairy products, tobacco, and fruit.

There is no Federal land within the watershed. Farmers own about 4,500 acres of forest land. The rest of the forest land is devoted to resort areas and summer homes or held as an investment.

Past use of forest land is responsible for present stand-size and condition. Although largely immature, these stands have a potential for hydrologic improvement and for the production of timber crops. Sawtimber (1,500 board feet or more per acre) occupies 35 percent of the forest land, poletimber (200 cubic feet or more per acre) 61 percent, and the remaining 4 percent of the forest land is seedlings and saplings.

Given protection, care and maaagement the forest stands are expected to contribute substantially to the future over-all economy of the watershed.

Industry within the area consists of the manufacture of machine needles, surgical needles, decorated metal products, name plates, dials, and radiators for commercial and industrial use. These industries have an estimated annual payroll in excess of $2,500,000.

Transportation facilities are excellent. The New York, New Haven and Hartford, and the New York Central Railroads service the area. The major highways are Route 10, Route U. S. 202, and the Massachusetts Turnpike.

Utilities servicing the area include electric power, natural gas and oil.

WATERSHED PROBLEMS

Floodwater Damages

Damages in excess of $820,000 occurred within the Powdermill Brook Watershed, as the result of the hurricane "Diane", August 18-19, 1955. This storm caused major damages to 77 homes housing 460 people, 10 industrial and commercial establishments employing 625 people, 3 farms producing high value crops, a mile of paved highway, a bridge, and 2 railroad culverts. Other storms causing major damage occurred in November 1927, March 1936, September 1938, and December 1948.

Approximately 178 acres of bottomland is subject to flooding. Fifty acres are used for intensive production of high value vegetable crops. Celery, scullions, and spinach are the main crops. The remaining acreage is used for residential and industrial purposes.

The area from Sandy Hill Road to the Westfield River is subject to flooding by backwater from the Westfield River. These damages are not attributable to the Powdermill Brook.

Sandy Mill Brook confluences with Powdermill Brook below reach 2 (see map) and does not contribute to damages in reaches 1 and 2.

Indirect damages to agriculture are: (1) loss of perishable products due to disruption of transportation facilities, (2) loss of perishable products from failure of refrigeration equipment caused by interruption of electric power.

Non-agricultural indirect damages are: (1) loss of industrial production, (2) loss of orders because of delayed shipment, (3) loss of wages to employees, (4) the high cost of re-routing rail and vehicular traffic.

Erosion Damage

Erosion damage in the watershed consists of streambank cutting, sheet and rill erosion. The magnitude of these damages is not great enough to support land treatment measures for flood prevention.

Sediment Damage

A sediment damage study of the watershed revealed a small amount of damage from swamping, scouring, and infertile overwash. These damages were evaluated as part of the floodwater damages.

Problems Relating to Water Management

The development of additional areas for recreation including fishing, hunting and nature studies is desirable. Existing facilities do not meet the current and future needs.

Agricultural water management problems, such as drainage and irrigation, are local in nature and do not require project action. The needs for drainage and irrigation are being met by individual landowners and operators under other going programs.

EXISTING OR PROPOSED WORKS OF IMPROVEMENT

There are no existing works of improvement in the watershed which provide measurable flood prevention benefits, and no flood protection measures are presently planned for this watershed.

The works of improvement as set forth in this plan will contribute to the comprehensive development of the Westfield River Basin.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

Land treatment measures contained in this plan are for the purpose of watershed protection. These measures contribute to program objectives of reducing runoff and erosion by increasing infiltration rates and water retention capacity of the soil.

Acceleration of the land treatment program now being carried out by the Hampden Soil Conservation District is needed to accomplish these objectives. Land treatment is especially important for protection of these lands to support, supplement, and insure the useful life of the structural measures. The application of the land treatment measures contained in this work plan will promote conservation, development and improvement of agricultural land and water management. These measures provide for using the land within its capabilities and treat it according to its needs.

The following measures are to be installed during a five-year period:

Cropland and Pasture Practices

These land treatment measures have been developed for installation on the farm lands within the watershed. They are based on a survey of conservation needs made by the Hampden Soil Conservation District.

1. Conservation Cropping Systems (500 acres)

   This practice provides for growing crops in combination with needed cultural and management measures. Cropping systems include the use of rotations that contain grasses and legumes. This practice maintains and improves the soil structure thus improving the rate of infiltration and waterholding capacity of the soil.

2. Cover Cropping (80 acres)

   This practice involves the use of close growing crops between periods of regular crop production or during over-winter periods in cultivated orchards.

3. Hayland Planting (200 acres)

   Establishing long term hay stands of grasses and legumes.

4. Pasture Renovation (200 acres)

   The improving of permanent pasture by discing or other mechanical methods to increase vegetative cover.

5. Critical Area Planting (75 acres)

   The stabilizing of silt-producing and severely eroded areas by establishing vegetative cover. This includes woody plants, such as trees, shrubs, or vines and adapted grasses or legumes established by seeding or sodding to provide long term ground cover.

6. Diversions (.5 mile)

   Grading or digging a channel across the slope with a supporting ridge on the down-hill side, to intercept excessive runoff and protect areas below from erosion and overflow.

7. Grassed Waterways (5 acres)

   Reshaping or grading and establishing suitable vegetation of natural waterways or depressions.

8. Grade Stabilization Structures (No. 5)

   Installing a grade stabilizing structure or structures in water courses. Such structures may include drop inlets, chutes, drops or others.

9. Streambank Protection (.2 mile)

   Improving the hydraulic characteristics of streams or excavated channels.

Forestry Practices

The following remedial program has been developed by the local people from a statement of land treatment needs prepared by the Massachusetts Division of Forests and Parks and the U. S. Forest Service. Land treatment needs were determined by a field survey of the watershed.

To insure proper forest land treatment and maximum watershed protectiin the following measures will be installed:

1. Tree Planting (60 acres)

   Artificial reforestation of certain open land is necessary to adjust land use with capability and to reduce runoff and erosion by developing a protective cover and an absorbent forest floor "sponge" of humus and litter. Under such conditions the soil is protected, infiltration rates improved, soil moisture and storage capacity increased, and the land is put to its best use.

2. Hydrologic Cultural Operations (1,235 acres)

   These silvicultural operations are aimed at improving hydrologic conditions by manipulation of stand composition to create conditions favorable to the maximum production and protection of litter, humus, and forest cover. They include thinnings, weedings, improvement, and harvest cuttings.

3. Skid Trail and Logging Road Erosion Control (2 miles)

   The objective of this measure is to divert water from eroding skid trails and logging roads in order to reduce and control soil erosion and sedimentation. Simple water bars (ditches with pole or earthen diversions), spaced at specified intervals, are the usual means applied to slow down and divert water. Some eroding areas need revegetation to hold soil in place.

Estimated installation costs of the land treatment measures are shown in Table 1 of this work plan.

Structural Measures

One floodwater retarding structure and one multiple purpose floodwater retarding-fish and wildlife enhancement structure constitute the structural measures contained in this work plan.

These two structures control the runoff from 5,076 acres. This represents 40 percent of the entire watershed area, and 79 percent of the area contributing to the floodwater damages.

Powdermill Brook Structure

This structure is located on the Powdermill Brook approximately 800 feet upstream from the main line of the New York, New Haven and Hartford Railroad. This dam will be about 47 feet high and contain 100,000 cubic yards of earth fill. It will control 2,894 acres of drainage area and have capacity to store 4.0 inches of runoff or 966 acre-feet. The dam will have a self-regulating principal spillway consisting of a 48 inch reinforced concrete pipe conduit extending through the base of the dam, and a low, vertical, reinforced concrete drop inlet. Appurtenances to the drop inlet will include an anti-vortex device and a trash rack. This dam will not impound water except in times of excess runoff.

Arm Brook Structure

This structure is located on Arm Brook approximately 450 feet north of the Massachusetts Turnpike. This dam will be about 56 feet high and contain 77,200 cubic yards of earth fill. It will control 2,164 acres of drainage area and have capacity to store 3.3 inches of runoff or 581 acre-feet. The dam will have a self-regulating principal spillway consisting of a 42-inch reinforced concrete pipe conduit extending through the base of the dam, and a single-stage, vertical, reinforced concrete drop inlet. Appurtenances to the drop inlet will include an anti-vortex device, trash racks, and gate at the base. The top of the drop inlet will be set at an elevation to provide for sediment storage and a fish and wildlife enhancement pool. The permanent pool will have a surface area of 13 acres and a volume of 150 acre-feet.

Each dam will have, in addition to the principal spillway, a grassed emergency spillway built into one of the abutments. Emergency spillways are provided to pass storms of rare occurrence with safety to the structure. Storage capacity will be added to each structure to provide for the anticipated sediment accumulation over a fifty-year period. No relocation or modification of existing railroads, highways, bridges, homes or utilities is necessary for structure installations.

The total installation cost of these two structures is estimated to be $316,962. These structures will contain 1,547 acre-feet of floodwater detention capacity, 142 acre-feet of storage for fish and wildlife enhancement and 23 acre-feet for sediment storage.

TABLE 1 - ESTIMATED INSTALLATION COST
Powdermill Brook Watershed
Massachusetts

Installation Cost Item	No. to be Applied		Estimated Cost (Dollars)		
	Unit	Total Non-Fed. Lands	PL 566 Funds Non-Fed. Lands	Other Funds Non-Fed. Lands	Total
LAND TREATMENT FOR Watershed Protection					
Soil Conservation Service					
Conservation Cropping System	Acre	500		35,000	35,000
Cover Cropping	Acre	80		800	800
Hayland Planting	Acre	200		14,000	14,000
Pasture Renovation	Acre	200		14,000	14,000
Critical Area Planting	Acre	75		18,750	18,750
Diversions	Mile	.5		558	558
Grassed Waterways	Acre	5		1,850	1,850
Grade Stabilization Structures	No.	5		2,000	2,000
Streambank Protection	Mile	.2		2,816	2,816
Technical Assistance			6,300	4,940	11,240
SCS Subtotal			6,300	94,714	101,014
Forest Service					
Tree Planting	Acre	60		3,800	3,800
Hydrologic Culture Operations	Acre	1,235		30,400	30,400
Skid Trail and Logging Road Erosion Control	Mile	2		600	600
Technical Assistance			8,700	8,700	17,400
FS Subtotal			8,700	43,500	52,200
TOTAL LAND TREATMENT			15,000	138,214	153,214
STRUCTURAL MEASURES					
Soil Conservation Service					
Floodwater Retarding Structures	No.	1	100,352		100,352
Multiple Purpose Floodwater Retarding and Fish and Wildlife Enhancement Structures	No.	1	94,566	12,354	106,920
Subtotal - Construction			194,918	12,354	207,272
Installation Services					
Soil Conservation Service					
Engineering Services			52,802		52,802
Other			19,353		19,353
Subtotal - Installation Services			72,155		72,155
Other Costs					
Land, Easements and Rights-of-way				35,462	35,462
Administration of Contracts				2,073	2,073
Subtotal - Other Costs				37,535	37,535
TOTAL STRUCTURAL MEASURES			267,073	49,889	316,962
TOTAL PROJECT			282,073	188,103	470,176
Summary					
Subtotal - SCS			273,373	144,603	417,976
Subtotal - FS			8,700	43,500	52,200
TOTAL PROJECT			282,073	188,103	470,176

Price Base 1961

August 1961

BENEFITS FROM WORKS OF IMPROVEMENT

The works of improvement included in this work plan will provide flood protection to ten industrial and commercial establishments employing approximately 625 people; 77 residences housing about 460 people; 3 farms; one highway bridge; and approximately one mile of streets and highways.

The works of improvement contained in this work plan will give 98.4 percent reduction in damages caused by runoff of 3.98 inches in 6 hours. This is estimated to be a 500-year frequency storm.

The "Diane" storm of August 18-19, 1955, produced runoff greater than that to be expected from a 500-year frequency storm. The works of improvement contained in this work plan would not provide a high level of protection from a reoccurrence of the "Diane" storm.

The combined land treatment and structural program will reduce average annual damages in the watershed from $19,156 to $175 or 99 percent (see Table 10). The direct floodwater damages will be reduced from $16,053 to $151, and the indirect floodwater damages from $3,103 to $24.

The reduction in direct average annual floodwater damages, by type, is as follows:

Agricultural	From	$ 2,147	to	$124	(94.2%)
Retail and Commercial	From	10,999	to	22	(99.8%)
Residential	From	2,711	to	5	(99.8%)
Road, Bridge and Utility	From	195	to	0	(100.0%)

Damages in agricultural reach No. 2 (see map) caused by floods that occur more frequently than once in 20 years will be practically eliminated. The peak flows from Powdermill Brook produced by the less frequent storms will be reduced. However, the extent of reduction was not evaluated because these flood events may coincide with backwater flooding from the Westfield River. It would be difficult to differentiate the damages caused by floods from Powdermill Brook and the backwater from Westfield River. Damages caused by the Westfield River in this reach will not be reduced by the works of improvement included in this work plan.

The fish and wildlife pool in the Arm Brook site would provide a high-quality trout habitat, and support a considerably increased angling opportunity over that provided by the inundated stream segment. Some 342,500 persons live in the watershed area and in the nearby cities of Westfield, Holyoke, West Springfield, Chicopee and Springfield and there is a great demand by fishermen from these areas for a trout fishery of the type that could be produced in the impoundment. It is estimated that about 3,000 man-days of fishing could be provided for area fishermen annually.

COMPARISON OF BENEFITS AND COSTS

The total average annual benefits of the structural works of improvement contained in this plan are $17,582. The average annual cost of these structural measures is $11,360. The benefit-cost ratio of the structural measures is 1.5 to 1. Benefits for fish and wildlife enhancement are not evaluated and, therefore, neither the cost nor benefits for this purpose are included in these figures.

ACCOMPLISHING THE PLAN

Land Treatment Measures

The Hampden Soil Conservation District will assist landowners and operators cooperating with the district in the preparation and application of farm conservation plans. Before construction begins on a structure, fifty percent of the land needing protection in the drainage area above will be under cooperative agreement with the Soil Conservation District.

The Agricultural Extension Service of Massachusetts will assist the Soil Conservation District in developing and carrying out an information and educational program to stimulate interest in watershed activities.

The forest land treatment measures will be installed by the landowners with technical assistance furnished by the Massachusetts Division of Forests and Parks in cooperation with the U. S. Forest Service. Individual management plans will be prepared for at least 70 forest landowners, outlining practical measures to be applied in the immediate future to maintain and improve the hydrologic condition of their forest land. Other technical assistance is needed to assure protection of watershed values and completion of the program. Included are supplemental activities such as developing timber sale or operating contracts, laying out skid trail and logging road systems, stimulation of landowner interest and participation in the program, and general planning and supervision of the program.

The Hampden County Agricultural Stabilization and Conservation Committee through the Agricultural Conservation Program will assist by offering cost-sharing on the land treatment measures and will encourage farmers in the watershed to apply those measures included in the work plan. Funds permitting, the State Agricultural Stabilization and Conservation Committee will allocate additional ACP funds to the County for carrying out cost-sharing practices to further accelerate the installation of these land treatment measures. The actual determination of how much assistance can be provided will be made on an annual basis and will be influenced by the needs and desires of the landowners.

Technical assistance will be provided by the Soil Conservation Service with funds provided by Public Law 566 and other programs. This assistance will be provided for the installation of land treatment measures for watershed protection, including assistance needed for the development of basic conservation plans on farms in the watershed.

The land treatment measures are to be installed over a five-year period.

Structural Measures

The Soil Conservation Service will provide the installation services to design, layout and supervise construction. The Service will pay construction costs allocated to flood prevention, and P. L. 566 share of the cost of construction allocated to fish and wildlife enhancement.

The City of Westfield will be responsible for administering the contracts for installation of structural measures.

The City of Westfield will obtain, at no cost to the Federal government, all land, easements and rights-of-way necessary for installation of the structural measures. The city will pay the allocated non-Federal share of construction costs for fish and wildlife enhancement. Provisions for public access to the Arm Brook site will be included in the acquisition of land, easements and rights-of-way. No special tax levy will be made for these purposes.

The Massachusetts Division of Fisheries and Game will provide material and personnel to practice fish and game management measures in the Arm Brook site.

The sponsoring local organizations do not intend to obtain a Farmers Home Administration loan.

Federal assistance for carrying out the works of improvement described in this plan will be provided under the authority of the Watershed Protection and Flood Prevention Act, Public Law 566 (83rd Congress, 68 Stat. 666) as amended.

The structural works of improvement will be installed in one year.

The schedule for installation of land treatment and structural works of improvement is as follows:

Year		Structural Measures	Land Treatment	Total
First	- P. L. 566 funds	267,073	3,000	270,073
	Other funds	49,889	27,642	77,531
	Yearly Total	316,962	30,642	347,604
Second	- P. L. 566 funds	--	3,000	3,000
	Other funds	--	27,643	27,643
	Yearly Total	--	30,643	30,643
Third	- P. L. 566 funds	--	3,000	3,000
	Other funds	--	27,643	27,643
	Yearly Total	--	30,643	30,643
Fourth	- P. L. 566 funds	--	3,000	3,000
	Other funds	--	27,643	27,643
	Yearly Total	--	30,643	30,643
Fifth	- P. L. 566 funds	--	3,000	3,000
	Other funds	--	27,643	27,643
	Yearly Total	--	30,643	30,643
Project Period Totals				
	P. L. 566 funds	267,073	15,000	282,073
	Other funds	49,889	138,214	188,103
	Grand Total	$316,962	$153,214	$470,176

PROVISIONS FOR OPERATION AND MAINTENANCE

Land Treatment

Land treatment measures will be maintained by the landowners or operators of the lands in cooperation with the Hampden Soil Conservation District. Technical assistance and guidance will be provided by the Soil Conservation Service and by the Massachusetts Division of Forests and Parks in cooperation with the U. S. Forest Service.

Structural Measures

The City of Westfield will be responsible for operation and maintenance of the floodwater retarding structure on Powdermill Brook and the multiple purpose floodwater retarding-fish and wildlife enhancement structure on Arm Brook. Necessary funds will be provided through appropriations by the city.

An operation and maintenance agreement will be executed between the City of Westfield and the Federal government prior to issuing the invitations to bid for the construction of the structures.

Inspections of the structural works of improvement will be made annually and after major storms as provided for in the operation and maintenance agreement. The Soil Conservation Service will provide at least one technical representative to accompany those making these inspections.

The annual cost of operating and maintaining the two structures is estimated to be $1,200 and will consist of but not be limited to, the following:

1. Remove and burn debris.
2. Refill, smooth and vegetate rilling on embankments, spillways and drainage ways.
3. Realign disposal channel.
4. Repair damaged riprap or other works.
5. Repair fences and gates.
6. Maintain a good sod cover.

The City of Westfield will keep records of maintenance work performed and costs therof, and report them annually to the Soil Conservation Service.

COST SHARING

The total project cost is estimated to be $470,176. Forty percent or $188,103 will be borne by other than Public Law 566 funds. The remaining 60 percent or $282,073, will be provided from Public Law 566 funds.

The following costs will be paid by other than Public Law 566 funds:

1. The cost of applying land treatment measures on non-Federal land amounting to $138,214. Of this amount $94,714 is for cropland and pasture practices, and $43,500 is for forestry practices.

   The cost of applying land treatment measures estimated to be $89,774 for cropland and pasture practices and $33,960 for forestry practices will be borne by local landowners and operators.

   State funds will provide $8,700 for technical assistance on forestry practices, and tree planting stock with an estimated value of $840.

   Other state and Federal programs will provide technical assistance for cropland and pasture practices at an estimated cost of $4,940.

   It is expected that landowners and operators will utilize cost-sharing assistance made available under the Agricultural Conservation Program through the Hampden County Agricultural Stabilization and Conservation Committee. The Clarke-McNary Act and the Cooperative Forest Management Act will make substantial contributions to the program during the five-year installation period. It is further expected that such cost-sharing assistance as will be available under other Federal and State programs will be utilized.

2. The cost of providing land, easements and rights-of-way estimated to be $35,462. This includes $3,459 allocated to fish and wildlife enhancement in the Arm Brook site.

3. The cost of administering contracts estimated to be $2,073. This includes $210 allocated to fish and wildlife enhancement in the Arm Brook site.

4. The non-Federal portion of construction costs allocated to fish and wildlife enhancement in the Arm Brook site, estimated to be $12,354.

5. The annual cost of operating and maintaining the structural works of improvement, estimated to be $1,200. This includes $137 allocated to fish and wildlife enhancement in the Arm Brook site.

The following costs will be paid by the Federal government from Public Law 566 funds:

1. The cost of providing the technical assistance needed to accelerate the land treatment measures on non-Federal land, estimated to be $15,000. Of this amount $6,300 will be used by the Soil Conservation Service and $8,700 by the U. S. Forest Service.

2. The cost of installation services associated with the structural works of improvement, estimated to be $72,155. This includes $7,377 allocated to fish and wildlife enhancement in the Arm Brook site.

3. The construction cost of structural measures, estimated to be $194,918. This includes $8,645 allocated to fish and wildlife enhancement in the Arm Brook site.

CONFORMANCE OF PLAN TO FEDERAL LAWS AND REGULATIONS

The Powdermill Brook Watershed is a tributary of the Westfield River. The project contained herein is a logical step in the comprehensive development of the Westfield River, which is a tributary of the Connecticut River.

This work plan conforms to all applicable State and Federal laws, including provisions of the Soil Bank Act, Public Law 540, 84th Congress, as amended.

SECTION 2

INVESTIGATIONS, ANALYSES, SUPPORTING TABLES AND MAPS

LAND TREATMENT MEASURES

Total land treatment needs have been estimated by work unit personnel by studying aerial photographs of the watershed and by ocular observation of most of the land currently in farm crop production. The total program planned for installation over the five-year period was based on estimates of what the cooperators would accomplish if adequate technical assistance were available giving due consideration to the added stimulus from the watershed project. The acreage, number of cooperators and number of basic plans in the watershed area were prorated against the totals for the Soil Conservation Districts to determine the level of the going program in the watershed.

The difference between the planned program and the going program determined the accelerated program which is included in this work plan. Technical assistance needed for the accelerated program was determined by using current work unit rates for planning and application activities.

HYDRAULICS AND HYDROLOGY

General

Procedures and criteria used in the development of the hydrologic and hydraulic phases of the work plan are outlined in National Engineering Handbook, Section 4, Hydrology, Supplement A and other Soil Conservation Service technical guides and memorandums.

The "Diane" flood of August 19, 1955, was used as a basis in the damage analysis of the watershed. The discharges and damages in the watershed were increased considerably in this storm by the failure of two railroad embankments across the valley directly upstream of the damage area. This failure was caused primarily by the limited capacity of the culverts through the embankments. These two culverts have both been replaced with larger pipes which subsequent studies show to be adequate. The effect of this change was recognized in the evaluation of flood flows and damages.

Frequency Data

Rainfall versus frequency relationships were derived from U. S. Weather Bureau, Technical Paper No. 29. Soil-cover complex numbers were computed from information furnished by the Soil Conservation Service and the U.S.D.A. Forest Service. Runoff data was obtained using the above information and E&WP Unit Engineering Memorandum No. 36, Hydrology No. 4.

A monthly distribution of flood probability was developed from stream flow records in the area for agricultural damage appraisals.

Evaluation Routing

The runoff from the two year, twenty year, and one hundred year storms were stream routed to the damage areas. The watershed above the damage area was divided into nine sub-watersheds. Synthetic hydrographs were developed for each sub-watershed for the three storms. These hydrographs were stream routed through successive sub-watersheds using Wilson's method as outlined in NEH-4A. The peak discharges at the damage point were plotted to obtain a discharge frequency curve which was used in the economic evaluation of the watershed.

The effect of land treatment measures was computed using the change in complex curve number by the procedure described in E&WP Unit Memorandum No. 34, Hydrology No. 3.

The same three storms of the evaluation series were routed to determine the peak flows with the proposed project. The hydrographs were graphically flood routed through the two retarding structures by Method No. 2, NEH-5, Hydraulics. The outflow from the structures were then stream routed to the damage area by Wilson's Method. The future discharge versus frequency curve was developed using the peak flows from these three storms.

Key Storm Routings

The storm of August 18 and 19, 1955, was reproduced from local rainfall records. The recorded rainfall for this storm was 19.76 inches in 34 hours. The sub-watershed hydrographs were developed using one hour increments. These hydrographs were stream routed to the damage reaches by Wilson's Method. The storm peak discharges were checked at the new railroad culverts to determine if the embankments would be endangered. Study revealed that the capacity of the culverts is sufficient to protect the embankments for a reoccurrence of this storm. This study was based upon stream hydraulics with no excessive debris problem or other unforseeable adverse conditions. The structures proposed in this plan would give added protection to the embankments.

The "Diane" storm was also routed under future conditions to determine the safety of the proposed structures. The storm was graphically flood routed through the sites. These routings proved that a reoccurrence of the "Diane" storm would not endanger the structures.

Rating Curves

Water surface profiles were used to develop rating curves for the damage reaches. A one-foot contour topographic map was made of the floodplain from Sandy Hill Road to North Elm Street. Cross-sections were taken from this map. Additional cross-sections were surveyed as needed above North Elm Street. Water surface profiles were computed for four discharges from Sandy Hill Road upstream to the upper railroad culvert, using the Step Method as outlined in NEH-4A. The backwater effect of the Westfield River on these profiles was considered. Rating curves were developed from these profiles.

Evaluation

An evaluation series of stage versus percent chance was prepared for each reach. The evaluation series was taken to a 500 year frequency for the residential and commercial damages. The area inundated by storms up to a 20 year frequency were plotted on the topographic map for the agricultural damage evaluation. Storms of less frequent occurrence may coincide with backwater from the Westfield River. Therefore, no evaluation was made for storms of greater magnitude. Agricultural benefits would be derived from larger storms which do not coincide with backwater from the Westfield River. These benefits have not been evaluated.

Structures

The 100 year floodwater detention requirements for the two floodwater retarding structures were determined by the procedure in Technical Release No. 10. The maximum volume of storage required was based on a 55 hour and a 70 hour storm for the Arm Brook site and Powdermill Brook site respectively. These requirements were greater than those determined by routing the 6 hour, 100 year rainfall hydrograph through the sites using antecedent moisture condition III. Hydrographs for emergency spillway and freeboard design were developed following the recommended criteria in E&WP Unit Memorandum No. 47, Hydrology No. 7.

ECONOMICS

Damage Appraisals

A complete damage survey was conducted within the flood plain of the Powdermill Watershed. Ninety-eight appraisals, keyed to the flood stage of hurricane "Diane", August 19, 1955, were collected. Damage estimates were made by one-foot increments below the stage of the key storm to the elevation where there was no remaining property damage. Damages were estimated at a 1961 price base and converted to long-term price projections.

Some sediment damage occurs to agricultural land within the watershed. This was included in the floodwater damage appraisal and not considered separately.

The indirect damages were estimated to be 20% of the direct damages for residential and commercial and 15% for agricultural in accord with Chapter 3, Economics Guide.

Evaluation

Average annual damages and benefits were computed using the frequency method described in Chapter 3 of the Economics Guide.

The floodwater retarding structure and the floodwater retarding-fish and wildlife enhancement structure were evaluated as one unit because of their interdependence to a common damage center.

Residential, commercial and utility damages were tabulated for each hydraulic reach. They were evaluated up to a 500 year storm.

Agricultural damages are confined within Reach 2 and were evaluated separately. Present cropping pattern, yield levels and cultural practices were obtained from local farmers, Soil Conservation Service technicians, State and Federal market service and extension service. Damage rates were established by fifteen-day intervals for the growing season. Monetary values were computed in accordance with Economic Guide.

Agricultural damages were evaluated only up to the 20 year storm due to the possible effect of backwater from the Westfield River.

Cost Allocation

The Arm Brook structure will be multiple purpose for flood prevention and fish and wildlife enhancement. Allocation of costs by purposes were computed by the use-of-facilities method. The structure provides for 8 acre-feet for sediment storage, 142 acre-feet for fish and wildlife purposes, and 581 acre-feet for floodwater storage. The sediment storage was prorated to flood prevention and fish and wildlife enhancement in proportion to the storage provided for each of these purposes.

Computation of Total Cost Allocation

	Flood Prevention	Fish and Wildlife Enhancement	Total
1. Capacity, including allocated sediment	587.43	143.57	731
2. Percentages to be used for joint costs	80.36	19.64	100
3. Total allocated costs*	$131,118	$32,045	$163,163

*There were no specific costs for this structure.

The cost of each installation item is allocated to each purpose using the same percentages as were used to allocate the total cost, as follows:

Computation of Allocation of Cost of Installation Items by Purpose

Installation Item	Flood Prevention (80.36%)	Fish and Wildlife Enhancement (19.64%)	Total
1. Construction	85,921	20,999	106,920
2. Installation Services	30,185	7,377	37,562
3. Administering Contracts	859	210	1,069
4. Land, easements & rights-of-way	14,153	3,459	17,612
Totals	131,118	32,045	163,163

Of the $32,045 allocated to fish and wildlife enhancement, $16,022 will be provided from Public Law 566 funds and $16,023 from other funds.

Computation of Cost Sharing

	P. L. 566 Funds			Other Funds		
Installation Item	Flood Prevention	Fish & Wildlife Enhancement	Total	Flood Prevention	Fish & Wildlife Enhancement	Total
1. Construction	85,921	8,645	94,566	-	12,354	12,354
2. Installation Services	30,185	7,377	37,562	-	-	-
3. Administering Contracts	-	-	-	859	210	1,069
4. Land, easements & rights-of-way	-	-	-	14,153	3,459	17,612
Totals	116,106	16,022	132,128	15,012	16,023	31,035

Land, Easements and Rights-of-way

The local organization estimated the cost at $238 per acre. This is an average cost per acre for all property needed to install structural measures. It also includes estimated cost of fees and services.

GEOLOGY

Structure Site Investigation

A preliminary examination of the proposed sites reveals many similar characteristics. Both sites are located in an area of intense glaciation. The unconsolidated material consists of till and stratified deposits of glacio-lacustrine origin. The till ranges from clays and silts to large boulders several feet in thickness. Valley bottoms range from a mantle of compressible alluvial silts and clays to sands and gravels. It is possible that the compressibility of materials may require intense investigation.

Arm Brook site is planned to be a multiple-purpose structure. Preliminary geologic investigation revealed an impermeable layer of silts which would prevent excessive leakage.

Sediment and Erosion Studies

Sediment damage in the watershed is negligible being confined to infertile overwash and some scouring. These sediment damages were not of sufficient extent to warrant a detailed survey and are included as floodwater damages.

The Probable Soil Loss Formula was used in computing the sediment storage requirement for each structure. Trap efficiency was obtained from the trap efficiency curve ESNE-29 using the medium curve.

STRUCTURE INVESTIGATION

Floodwater Retarding and Multiple Purpose Structures

The engineering, hydrologic, geologic, and economic studies made of this watershed led to the selection of the two structures described in this plan as the best solution to the flood problems.

The structures were proportioned in accordance with Soil Conservation Service criteria defined in SCS Engineering Memorandum 27 (Revised) and as recommended in E&WP Engineering Memorandum #47, Hydrology #7. The procedures used are described in National Engineering Handbook, Section 5 and Technical Release #2.

Principal Spillways

The reinforced concrete pipe principal spillways were proportioned to produce outflows consistent with available storage and the downstream channel capacity. Both sites have one-stage, reinforced concrete risers. The riser crest for the Powdermill site is set at an elevation which will provide for an estimated 50-year sediment accumulation. An opening of the bottom of the riser will provide for passing normal flow. The crest of the Arm Brook riser is at an elevation which will provide for storage desired for fish and wildlife enhancement in addition to 50-year sediment accumulation.

Emergency Spillways

The emergency spillways will have a short length of level section, an entrance channel on an adverse grade, and an exit channel on a steep slope. The exit channels are straight until they are beyond the downstream toe of the dam.

The emergency spillways were proportioned by the procedure outlined in Technical Release #2. The proportions were then checked by a graphical flood routing. The stage discharge curve was prepared from water-surface profiles for various discharges.

Field Surveys

Transit and plane table were used in making topographic surveys of the two structure sites, and in running centerline profiles of the two dams. The topographic surveys were used to develop stage-storage and stage-area curves for the structural layouts. Profiles of the centerline of the dams were used in estimating earth fill quantities.

TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION
Powdermill Brook Watershed
Massachusetts

Structure Site Name	Installation Costs - PL 566 Funds					Installation Costs - Other Funds					Total Instal-lation Cost
	Construction		Instal.Services		Total	Construction		Other		Total	
	Engineers Estimate	Contin-gencies	Engin-eering	Other	PL 566 Funds	Engineers Estimate	Contin-gencies	Adm. of Contract	Easements & R.of W.	Other Funds	
Arm Brook	78,805	15,761	27,579	9,983	132,128	10,295	2,059	1,069	17,612	31,035	163,163
Powdermill Brook	89,600	10,752	25,223	9,370	134,945			1,004	17,850	18,854	153,799
GRAND TOTAL	168,405	26,513	52,802	19,353	267,073	10,295	2,059	2,073	35,462	49,889	316,962

Price Base 1961

August 1961

TABLE 3 - STRUCTURE DATA
Floodwater Retarding Structures
Powdermill Brook Watershed - Massachusetts

ITEM	UNIT	ARM	POWDERMILL	TOTAL
Drainage Area	Sq. Mi.	3.4	4.6	8.0
Storage Capacity				
Sediment	Ac. Ft.	8	15	23
Fish and Wildlife	Ac. Ft.	142	---	142
Floodwater Detention	Ac. Ft.	581	966	1,547
Total	Ac. Ft.	731	981	1,712
Surface Area				
Sediment Pool	Ac.	2	5	7
Fish and Wildlife Pool	Ac.	13	----	13
Flood Detention Pool	Ac.	56	56	112
Volume of Fill	Cu. Yds.	77,200	100,000	177,200
Elevation Top of Dam	Ft.	218.5	202.5	---
Maximum Height of Dam	Ft.	56	47	---
Emergency Spillway				
Crest Elevation	Ft.	213.5	197.0	---
Bottom Width	Ft.	184	260	---
Type	-	Earth	Earth	---
Percent Chance of Use	-	1.0	1.0	---
Aver. Curve No.-Con'd II	-	68	68	---
Emergency Spillway Hydrograph				
Storm rainfall (6 hr.)	In.	15.2	15.0	---
Storm runoff	In.	10.7	10.5	---
Velocity of Flow (v_c) 1/	Ft./sec.	8.0	8.0	---
Discharge rate 1/	c.f.s.	3,060	4,200	---
Max. w.s. elev. 1/	Ft.	217.0	200.5	---
Freeboard Hydrograph				
Storm rainfall (6 hr.)	In.	21.7	21.4	---
Storm runoff	In.	16.9	16.6	---
Velocity of Flow (v_c) 1/	Ft./sec.	9.0	9.5	---
Discharge rate 1/	c.f.s.	5,540	7,900	---
Max. w.s. elev. 1/	Ft.	218.5	202.3	---
Principal Spillway				
Capacity at E.S. Crest	c.f.s.	271	330	---
Capacity Equivalents				
Sediment volume	In.	0.04	0.06	---
Detention volume	In.	3.3	4.0	---
Spillway storage	In.	1.1	0.8	---
Class of Structure	-	c	c	---

1/ - Maximum during passage of hydrograph.

TABLE 4 - SUMMARY OF PHYSICAL DATA
Powdermill Brook Watershed
Massachusetts

Item	Unit	Future Without Project	Future With Project
Watershed Area	Sq. Mi.	20.0	---
Watershed Area	Acre	12,825	---
Area Privately Owned	Acre	12,055	11,906
Area Non-Federal Public	Acre	770	919
Area of Cropland	Acre	1,339	1,339
Area of Woodland	Acre	7,725	7,712
Area of Grassland	Acre	1,025	1,025
Area of Farmstead & Urban	Acre	1,885	1,885
Area in Ponds, Streams, Lakes, etc.	Acre	260	273
Area of Brush & Idle	Acre	591	591
Average Annual Rainfall	Inches	47	---

August 1961

TABLE 5 - SUMMARY OF PLAN DATA
Powdermill Brook Watershed
Massachusetts

ITEM	UNIT	QUANTITY
Years to Complete Project	Year	5
Total Installation Cost		
Public Law 566 Funds	Dollar	282,073
Other Funds	Dollar	188,103
Annual O & M Cost		
Non-Federal	Dollar	1,200
Average Annual Monetary Benefits 1/	Dollar	17,582
Agricultural	Percent	10.6
Non-Agricultural	Percent	89.4
Structural Measures		
Floodwater Retarding Structures	Each	1
Multiple Purpose Structures	Each	1
Area Inundated by Retarding Structures		
Sediment Pool	Acre	7
Fish and Wildlife Pool	Acre	13
Detention Pool	Acre	112
Watershed Above Retarding Structures	Acre	5,076
Reduction of Floodwater Damage	Dollar	18,981
By Land Treatment Measures for Watershed Protection	Dollar	1,399
By Structural Measures	Dollar	17,582

1/ From Structural Measures

Price Base 1961

August 1961

TABLE 6 - ANNUAL COSTS
Powdermill Brook Watershed
Massachusetts

Measures	Amortization of Installation Costs	O & M Costs Non-Federal	Other Economic Costs	Total
Evaluation Unit No. 1				
Floodwater Retarding Structure:				
Powdermill Brook	5,558	500		6,058
Multiple Purpose Floodwater Retarding and Fish and Wildlife Enhancement Structure:				
Arm Brook	4,739	563		5,302*
TOTAL	10,297	1,063**		11,360

Amortized at 2 5/8% for 50 years.

* Does not include $1,158 amortized installation costs and $137 annual operation and maintenance for fish and wildlife enhancement.

** O and M long term price level as projected by Agricultural Research Service, Price Projection, September 1957.

August 1961

TABLE 7 - MONETARY BENEFITS FROM STRUCTURAL MEASURES
Powdermill Brook Watershed
Massachusetts

Dollars 1/

Item	Estimated Average Annual Damages			Average Annual Monetary Benefits
	Without Project	After Land Treatment For W/S Protection	With Project	
Floodwater Damages				
Agricultural 2/	2,148	1,984	124	1,860
Retail & Commercial	10,999	10,201	22	10,179
Residential	2,711	2,515	5	2,510
Bridge, Road, etc.	195	180	0	180
Subtotal	16,053	14,880	151	14,729
Indirect Damages	3,103	2,877	24	2,853
Total All Damages	19,156	17,757	175	17,582

1/ Price base long term price level as projected by Agricultural Research Service, Price Projection, September 1957.

2/ Damages were not evaluated for flood events less frequent than the 20-year flood (see page 14).

August 1961

TABLE 8 - BENEFIT-COST ANALYSIS
Powdermill Brook Watershed
Massachusetts

Measures	Average Annual Benefits					Average Annual Cost	Benefit Cost Ratio
	Flood Prevention			Non-Agr. Water Mgmt.			
	Floodwater	Indirect	Changed Land Use	Fish & Wildlife Enhancement	Total		
EVALUATION UNIT NO. 1							
1 Floodwater Retarding Structure:							
Powdermill Brook							
1 Multiple Purpose Floodwater Retarding and Fish & Wildlife Enhancement Structure:							
Arm Brook							
Total	14,729	2,853	---	---	17,582	11,360	1.5 to 1*
GRAND TOTAL	14,729	2,853	---	---	17,582	11,360	

* Benefits for fish and wildlife are not evaluated and, therefore, neither the cost nor benefits for this purpose appear in the benefit cost ratio.

Price base long term price level as projected by Agricultural Research Service, Price Projection, September 1957.

August 1961

TABLE 9
ALLOCATION OF INSTALLATION COSTS OF STRUCTURAL MEASURES
Powdermill Brook Watershed
Massachusetts
(Dollars)

Item	Purpose		Total
	Flood Prevention	Fish & Wildlife Enhancement	
STEP A			
One Floodwater Retarding Structure (Powdermill)	153,799	---	153,799
One Multiple Purpose Floodwater Retarding and Fish & Wildlife Enhancement Structure (Arm)	131,118	32,045	163,163
TOTAL	284,917	32,045	316,962
STEP B			
P. L. 566	251,051	16,022	267,073
Other	33,866	16,023	49,889
TOTAL	284,917	32,045	316,962

Price Base 1961

August 1961

TABLE 10 - BENEFITS FROM WORKS OF IMPROVEMENT BY REACHES
Powdermill Brook Watershed
Massachusetts

Damage Reach	Drainage Area Above Reach	Discharge At Which Damage Begins	Present Conditions			Future Conditions		
			Peak Flow 100-Year Flood	Damages 100-Year Flood	Average Annual Damages	Peak Flow 100-Year Flood	Damages 100-Year Flood	Average Annual Damages
	Acres	c.f.s.	c.f.s.	Dollars	Dollars	c.f.s.	Dollars	Dollars
1	5,700	1,850	2,365	116,500	3,707	780	0	0
2	6,400	550	2,400	96,490	15,449	800	1,148*	175

* Agricultural

August 1961

Powdermill Brook

HAMPDEN COUNTY
APPROVED
JUL 25 1962
Walsh
Thomas F.
William F.
County Commissioners

Commonwealth of Massachusetts – Hampden ss.
"Specifications" – Filed June 13, 1962

CONSTRUCTION SPECIFICATIONS

1 - CLEARING

1.1 SCOPE

This specification covers the clearing from designated areas of all trees, brush, stumps, logs, down timber, woody vegetation, shrubs, stone walls, fences, minor structures when shown on the drawings, and all rubbish and the disposal of all materials resulting from the clearing operations.

1.2 CLEARING

Trees, brush, shrubs, stumps and other woody growth shall be cleared flush with the ground surface. Such growth may be cleared by cutting, pulling, grubbing or other approved methods. Trees shall be felled in such a manner as to avoid damage to trees to be left standing, to existing structures or installations and with due regard for the safety of persons and property.

1.3 TIMBER SALVAGE

All timber, in the areas to be cleared, shall become the property of the Contractor and shall be disposed of as specified under Item 1.4 (DISPOSAL OF REFUSE) or removed from the site prior to completion of the contract.

1.4 DISPOSAL OF REFUSE

All cleared material not salvaged shall be disposed of by burning, burying or other method approved by the Engineer. The time, location and manner of burning shall be subject to all public laws governing such operations and the Contractor shall be responsible for any damage to life and/or property caused by fires resulting from his operations. Where the work includes the removal of elm trees, such trees shall be disposed immediately after cutting and in such a manner as to prevent the spread of the Dutch elm disease. This shall be accomplished either by completely burning the trees or covering the trees with earth to a depth of at least six inches.

1.5 MEASUREMENT AND PAYMENT

The authorized area of clearing will be measured to the nearest one-tenth (0.1) acre. Clearing of material sites or borrow areas outside the designated area which the contractor elects to develop at his own option will not be measured or paid for. Approximate areas to be cleared will be shown on the drawings and shall be staked or otherwise designated by the engineer in the field. In the case of isolated trees, the diameter of the crown squared will be used as the area. Payment will be made at the contract unit price per acre for "Clearing" and shall be considered full compensation for all material, labor, equipment and any incidentals necessary for clearing and disposal of cleared materials.

2 - CLEARING AND GRUBBING

2.1 SCOPE

This specification covers the clearing from designated areas of all trees, brush, shrubs, logs, down timber, vegetation, stone walls, fences, minor structures when shown on the drawings, rocks and boulders, between 6 inches in diameter and one cubic yard in volume, and all rubbish and the grubbing of all stumps and woody roots and the disposal of all material resulting from the clearing and grubbing operations.

2.2 CLEARING AND GRUBBING

Clearing and grubbing shall consist of the removal of trees, brush, shrubs, stumps and other woody vegetation from above the ground surface; and the removal of all stumps, roots of one inch in diameter or larger, buried logs, rocks and boulders between six inches in diameter and one cubic yard in volume, sod and other objectionable material to a minimum depth of two feet below a structure subgrade and one foot below embankment foundation.

2.3 TIMBER SALVAGE

All timber, in the areas to be cleared, shall become the property of the Contractor and shall be disposed of as specified under Item 2.4 (DISPOSAL OF REFUSE) or removed from the site prior to completion of the contract.

2.4 DISPOSAL OF REFUSE

All cleared and grubbed material not salvaged shall be disposed of by burning, burying or other method approved by the Engineer. The time, location and manner of burning shall be subject to all public laws governing such operations and the Contractor shall be responsible for any damage to life and/or property caused by fires resulting from his operations. Where the work includes the removal of elm trees, such trees shall be disposed immediately after cutting and in such a manner as to prevent the spread of the Dutch elm disease. This shall be accomplished either by completely burning the trees and stumps or covering the trees and stumps with earth to a depth of at least six inches.

2.5 MEASUREMENT AND PAYMENT

The authorized area of clearing and grubbing will be measured to the nearest one tenth (0.1) acre. In the case of isolated trees, the diameter of the crown squared shall be used as the area. Approximate areas to be cleared will be shown on the drawings and shall be staked or otherwise designated by the engineer in the field.

Payment will be made at the contract unit price per acre for "Clearing and Grubbing" and shall be considered full compensation for all material, labor, equipment and any incidentals necessary for clearing and grubbing and disposal of cleared and grubbed materials. When "Clearing and Grubbing" is not shown as an item in the bid schedule, the price for such work specified herein shall be a subsidiary of the other items and no separate payment will be made for "Clearing and Grubbing" as such.

4 - EXCAVATION

4.1 SCOPE

This specification covers the required excavation, the removal and proper utilization or disposal of all excavated materials, and the shaping and finishing of all excavation work to the required lines, grades and cross sections.

4.2 CLASSIFICATION

4.2.1 General. All excavation to be paid for will be shown on the drawings under one of the following classifications:

Excavation - Common
Excavation - Rock

4.2.2 Excavation; Common. Common excavation shall consist of and include all earth, clay, sand, silt, gravel, shale, hard and compacted materials, such as hardpan, loosely cemented gravel, soft or disintegrated rock and similar materials that can be removed by hand, heavy ripping equipment, or common earth-moving equipment such as tractor-drawn scraper, power shovels, backhoes, and push tractors, and shall also include all boulders and loose rock less than one (1) cubic yard in volume.

The heavy ripping equipment, as specified hereinbefore, shall consist of a ripper or rooter unit weighing not less than eight thousand five hundred (8,500) pounds, equipped with a hard faced steel tooth, as recommended by the manufacturer, and drawn by a track-type tractor of not less than one hundred (100) draw-bar horsepower, in good condition and capable of developing not less than twenty-eight thousand (28,000) pounds draw-bar pull in first gear.

4.2.3 Excavation; Rock. Rock excavation shall consist of and include all excavation which, in the opinion of the Engineer, cannot be removed by the methods described hereinbefore for common excavation, and shall also include all boulders and detached rock one (1) cubic yard or greater in volume. In areas where blasting is not permitted, materials of rock character which require the use of power operated drills for removal will be classified as rock excavation.

4.3 TYPES OF EXCAVATION

4.3.1 General. The types of excavation herein specified indicate the general character and location of the excavation work to be performed.

The types of excavation covered herein are:

Embankment Foundation Excavation
Cutoff Trench Excavation
Foundation Drain and/or Toe Drain Trench Excavation
Channel Excavation
Emergency Spillway Excavation
Borrow Excavation

All excavations shall be completed to the lines and grades shown on the drawing or as directed by the Engineer. Unauthorized excavation beyond such limits and the backfill required to replace unauthorized excavation will not be paid for and the cost shall be borne by the Contractor. All material thus removed (without proper authorization) shall be replaced by concrete when a concrete structure is to be placed upon or against such surface, or by compacted fill material when fill is to be placed thereon. Prior to the start of any excavation the Contractor shall inform the Engineer in sufficient time to allow for cross sectioning of the excavation area. No back-fill shall be placed in an excavated area until the excavation has been approved by the Engineer. All loose material must be removed from such areas before backfilling.

The types of excavation that are considered subsidiaries of other items shall be so specified herein.

4.3.2 Embankment Foundation Excavation. Embankment foundation excavation shall consist of the required excavation for the removal of unsuitable material from the embankment area. The final depths and extent of the excavation will be determined by the nature of the material revealed in the area and by borings and/or soundings (such borings or soundings to be performed by the Engineer).

4.3.3 Cutoff Trench. Cutoff trench excavation shall consist of and include the removal of all materials encountered or involved in such excavation at the location shown on the drawings or as directed by the Engineer. The final depths and extent of the trench will be determined by the nature of the material revealed in the trench and by borings and/or soundings. (Such borings or soundings to be performed by the Engineer).

4.3.4 Structure. Structure excavation shall consist of the removal of all materials encountered or involved in the excavation and subgrade preparation for the placing of structures other than embankments. The final depths and extent of structure excavation will be determined by the nature of the material revealed and by borings and/or soundings.

4.3.5 Foundation Drain and/or Toe-Drain Trench. Foundation drain or toe-drain trench excavation shall consist of and include the removal of all materials encountered or involved in the construction of the drainage system as shown on the drawings. Direct payment for foundation or toe-drain trenches will not be allowed. Payment for such excavation shall be subsidiary to filter material as covered under specification no. 13, Structural Drainage.

4.3.6 Channel. Channel excavation shall consist of the required excavation for all channels and constructing, shaping and finishing all earth work involved for channels outside the embankment limits. Overcutting will be allowed six (6) inches below grade, but no payment will be made for the yardage resulting from the overcutting.

4.3.7 Emergency Spillway. Emergency spillway excavation shall consist of and include the required excavation to construct the emergency spillway as shown on the drawings or as directed by the Engineer and the proper utilization of such excavated material.

Suitable fill material excavated from the emergency spillway will not be paid for as excavation but will be paid for at the contract unit price for the class of fill in which it is placed. The selection of material suitable for fill shall at all times be as directed by the Engineer.

Rock encountered in the emergency spillway will be paid for as rock excavation.

Unsuitable or surplus material other than rock excavated from the emergency spillway and required to be wasted will be paid for as common excavation.

4.3.8 Borrow. Borrow excavation shall consist of and include the required excavation and proper utilization of approved materials, obtained from designated areas when sufficient quantities of suitable materials are not available from other required excavations.

The control of excavation in any borrow area and the selection of materials therefrom shall at all times be as directed by the Engineer. On completion of excavation, all borrow pits shall be left in a neat and sightly condition. Unless otherwise approved by the Engineer, all borrow pits shall be so graded and dressed that water will readily drain therefrom, and away from all embankments, berms, and structures. Borrow excavation will not be paid for as excavation but will be paid for at the contract unit price for the type of fill in which the material is placed.

4.4 CONSTRUCTION METHODS

4.4.1 Utilization of Excavated Material. All suitable material removed from the excavations shall be used insofar as practicable, in construction of the permanent works and at such other places as directed. The Contractor shall not waste materials removed from excavations and suitable for use in the construction of the permanent works, without a written application to do so and a written approval from the Engineer.

4.4.2 Disposal of Surplus and/or Waste Material. All surplus excavated material and/or all waste material shall be disposed of in areas shown on the plans or areas approved by the Engineer.

Waste material shall be placed in designated waste areas to the approximate elevations established by the Engineer, and the surfaces thereof shall be left in a neat and sightly condition and sloped to provide positive drainage. Compaction of the waste materials will not be required. The cost of disposal of all materials, unless otherwise specified, and all costs of placing and spreading the materials in the waste areas and dressing of the surfaces thereof shall be included in the respective contract unit prices for excavation, regardless of the source of materials, and no additional payment will be made therefor.

4.4.3 Blasting for Excavation. Blasting may be done only to the depth, amount, and extent, and in such locations approved by the Engineer. This approval will not relieve the Contractor of his responsibility in the blasting operation, and no payment will be made for any necessary extra excavation below or outside of the limit lines indicated on the drawings, or modifications thereof, due solely to injury caused by over-shooting, improper blasting, or carelessness on the part of the Contractor.

All blasting operations will be carried out in accordance with Federal, State and Local laws and requirements as set forth in Section 9 of the "Manual of Accident Prevention in Construction:, Fifth Edition, as published by the Associated Contractors of America, Inc.

4.4.4 Sheeting and Bracing. Sheeting and bracing as may be required to safely support the sides of excavations shall comply with the safety precautions as outlined in current and accepted safety manuals, such as "Manual of Accident Prevention in Construction", published by the Associated General Contractors of America, Inc.. Where sheeting and bracing are necessary to prevent caving of the walls of excavations and to safeguard the workmen, the excavations shall be dug to such widths that proper allowance is made for the space occupied by the sheeting and bracing. The Contractor shall perform the additional excavation required and furnish and put in place the necessary sheeting and bracing and shall remove the same as the excavation is filled, at his own expense.

4.4.5 Removal of Water. The Contractor shall construct and maintain all necessary cofferdams, channels, flumes, and/or other temporary diversion and protective works; shall furnish all materials required therefor; and shall furnish, install, maintain, and operate all pumping and other equipment for dewatering the various parts of the work' (including borrow areas), and for maintaining the foundations, cutoff trenches, and other parts of the work free from water as required for constructing each part of the work. After having served their purpose, all cofferdams and other temporary protective works shall be removed or leveled, to give a sightly appearance and so as not to interfere in any way with the operation, usefulness or stability of the permanent structures. No separate payment will be made for construction of temporary diversion and protective works, furnishing and operating pumping equipment, or other dewatering costs, since performance of this work is to be considered as subsidiary to work pertaining to the various contract items.

4.5 MEASUREMENT AND PAYMENT

The volume of the classes and types of excavation to be paid for will be measured by cross-section surveys before and after the excavation operations. It will be measured between (1) the surface lines as determined by a cross section survey after clearing and grubbing, removal of topsoil and foundation preparation, and (2) the neat lines, grades, and typical sections shown on the drawings or as modified by the Engineer. The volumes of the classes of excavation to be paid for will be computed to the nearest cubic yard by the method of average cross-sectional end areas.

Common excavation will be paid for at the contract unit price for "Excavation; Common". Rock excavation will be paid for at the contract unit price for "Excavation; Rock." Such payment shall be considered full compensation for furnishing all labor, materials, equipment, and incidentals necessary to complete the work as specified herein.

5 - EARTH FILL

5.1 SCOPE

This specification covers the foundation preparation for embankments and the materials, material placement, spreading, moisture control and compaction requirements for compacted fill, semi-compacted fill, uncompacted fill and backfill.

5.2 DEFINITIONS

"Embankment". The earth and/or rock fill portion of the permanent work such as an earth dam, dike or levee.

"Backfill". The refill of excavated areas around or adjacent to a structure which cannot be placed until the structure is completed or until a specified time has elapsed after concrete has been placed.

"Foundation". The prepared or natural surface upon which the embankment or earth fill is to be placed.

"Compaction". A mechanical process whereby the density of the soil is increased by rolling, tamping or other approved method.

"Optimum Moisture Content". The moisture content at which a specified amount of compaction effort will produce the maximum density of the soil.

"Maximum Dry Density". The dry density of a soil obtained by a specified amount of compaction effort at the optimum moisture content.

5.3 GENERAL PROVISIONS

5.3.1 Lines and Grades. All types of fills shall be constructed to the lines, grades, and cross sections indicated on the contract drawings unless otherwise directed by the Engineer. All finished surfaces shall be generally smooth and pleasing in appearance.

5.3.2 Conduct of Work. The Contractor shall maintain and protect all fill in a satisfactory condition at all times until final completion of all work under the contract. Any approved fill material which is rendered unsuitable after being placed in the fill, and before final acceptance of the work, shall be replaced by the Contractor in a satisfactory manner and no additional payment will be made therefor. The Contractor may be required to remove, at his own expense, any fill material placed outside of the prescribed lines.

Access and haul roads shall be located and constructed as approved by the Engineer. They shall be constructed to be free draining and shall be maintained in good condition throughout the contract period, unless otherwise directed by the Engineer.

5.4 TYPES OF FILL

5.4.1 General. All authorized earth fill will be shown on the drawings and/or specified in the bid schedule or ordered in writing by the Engineer under one of the following types:

Compacted Fill
Semi-Compacted Fill
Uncompacted Fill
Back Fill

5.4.2 Compacted Fill. Compacted fill shall consist of and include all fill deposited in layers and compacted by rolling or tamping to a specified density. Compacted fill constructed under this specification will be classified according to the specified percent of maximum dry density compaction to be secured, in conformance with the requirements of the following table:

CLASSIFICATIONS OF COMPACTED FILL

Required Percent of Maximum Dry Density	Class of Compacted Fill	
	Compaction Test	
	Modified A.A.S.H.O.	Proctor
100	A-1	B-1
95	A-2	B-2
90	A-3	B-3

Note: Maximum density shall be determined for all Class A fill by the test procedure specified in ASTM Standard D 1557, Method A, and for all Class B fill by the test procedures specified in ASTM Standard D 698.

Each class of fill shall be used in such structures or in such portions of designated structures as called for on the drawings and/or in the bid schedule or as directed, in writing, by the Engineer. The type of roller and the minimum pressure in pounds per square inch to be exerted by the roller may be called for on the drawings.

5.4.3 Semi-Compacted Fill. Semi-compacted fill shall consist of and include all fill deposited in layers and compacted by the following method:

a. Each lift shall be compacted by not less than two (2) complete passes of a tamping roller exerting a minimum pressure of two hundred (200) pounds per square inch.

5.4.4 Uncompacted Fill. Uncompacted fill shall consist of and include all fill, except backfill, deposited in gullies, depressions, and other approved locations, without regard to selection of material, or spreading, or compaction, so long as the final grade of the filled area is left in a reasonably smooth condition.

5.4.5 Backfill. Backfill shall consist of and include the refilling of excavated areas around and/or adjacent to conduits and/or other structures and compacting such fill to the required density as specified in 5.4.2.

5.5 FOUNDATION PREPARATION

5.5.1 Compacted and Semi-Compacted Fill. After completion of all required clearing and grubbing operations, removal of topsoil and unsuitable foundation material, the foundation area shall be loosened thoroughly by scarifying or plowing to a minimum depth of six (6) inches, except in areas where this requirement is waived by the Engineer. After removal of roots or other debris turned up in the process of loosening, the entire surface area of such section of embankment foundation shall be compacted to the same density as hereinafter specified for the class of fill to be placed immediately above the foundation.

No separate payment will be made to prepare the foundation area, the entire cost thereof to be included in the contract price for the specified fill.

5.5.2 Uncompacted Fill. Existing trees, brush, down timber, and other obstruction to placing the fill shall be removed or knocked down and spread in these areas, as approved by the Engineer. All foundation preparation work shall be considered as subsidiary work to the placement of the fill.

5.6 MATERIALS

5.6.1 General. The suitability of materials and their disposition in the fill will at all times be subject to approval by the Engineer. Mixing of materials during the excavation process at the borrow source may be required. Pockets of material of uniform particle size, such as sand, when encountered, shall be proportionally mixed with other material to obtain an acceptable fill material or shall be wasted when so directed by the Engineer.

All fill materials shall be obtained from required excavation, designated borrow areas or other approved borrow sources.

5.6.2 Compacted and Semi-Compacted Fill. Soil materials for compacted and semi-compacted fill shall be free of sod, brush, roots, and other perishable material. Compacted and semi-compacted fills will also be free of stones having a maximum dimension of more than six (6) inches.

5.6.3 Uncompacted Fill. Soil materials for uncompacted fill may contain sod, roots, brush, stones and other types of material. The amount and placement location of such materials shall at all times be subject to approval by the Engineer.

5.6.4 Backfill. Backfill material shall be the type and quality conforming to that specified for the adjoining fill material, except that no stones with a dimension of more than three (3) inches will be placed within two (2) feet of a structure.

5.7 PLACEMENT AND SPREADING

5.7.1 General. No fill material shall be placed until the foundation, subgrade, and/or cutoff trench areas have been inspected and approved by the Engineer. The contractor shall dewater the foundation, subgrade, and/or cutoff trench before any fill material is placed. During construction, the top surface of all earth fills shall be kept crowned with grades of not less than two (2) percent in order that the fill will drain freely towards the slopes.

No fill shall be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the fill.

Unless otherwise directed, the fill shall be maintained at approximately the same level regardless of the number of types of materials being placed, except that rock fills and filter blankets shall be so placed as to prevent mixing of earth fill material with filter blanket and/or rock materials.

The Contractor shall construct the fill in approximately horizontal lifts extending the entire length of the fill unless notified in writing by the Engineer that the construction of the fill in sections is permitted. The lengths of the sections and the end slopes will be determined by the Engineer where operations are not continuous throughout the entire length of the fill.

5.7.2 Compacted Fill. The distribution of materials throughout a fill shall be such that there will be no lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material in the fill. After placement, the fill materials will be spread by motor grader or other approved equipment. The thickness of the layers before compaction with rollers shall not be more than eight (8) inches. No material placed in the fill by dumping in piles or windrow shall be incorporated in a layer in that position, but shall be moved and spread by blading or similar approved methods.

5.7.3 Semi-Compacted Fill. The distribution of materials throughout a fill shall be such that voids will be held to a minimum. The materials will be placed and spread in such a manneras to thoroughly mix the materials so that they will be reasonably well graded. After placement the fill materials will be spread by a grader or other approved equipment to a thickness not greater than the dimension of the largest component of the material in the lift or not more than eight (8) inches if the largest material is eight (8) inches or less.

5.7.4 Uncompacted Fill. Uncompacted fill material may be placed in any conventional manner. All roots, brush, stumps, stones and similar material shall be placed a minimum of two (2) feet below the elevation of the finished grade. The final grade of the filled area shall be smooth and blend with the surrounding topography.

5.7.5 Backfill. Backfill material shall be placed and spread in layers not more than four (4) inches thick before compaction.

No backfill or other load shall be placed against or on top of concrete surfaces before expiration of the minimum period indicated below unless approved in advance by the Engineer.

Walls and Vertical Faces	7 days
Conduit (Inside forms in place)	7 days
Cradle or Bedding	2 days

Subsequent to the number of days indicated above, but prior to fourteen (14) days after placing concrete, backfill operations may be initiated. During this period backfill may be placed against and on top of concrete surfaces, if compaction is accomplished by power tampers, to a depth or thickness not to exceed two (2) feet unless approved otherwise in advance by the Engineer. Hauling and rolling equipment will not pass over the top of the structure prior to the elapse of the total curing period of fourteen (14) days unless approved in advance by the Engineer. At no time will hauling and rolling equipment be permitted to pass within two (2) feet, horizontally or vertically, of the structure or any part thereof. Backfill over and around structures shall be brought up uniformly on all sides.

5.8 MOISTURE CONTROL

5.8.1 Compacted Fill. During the compaction operations the abutments at the level of the fill surface, the surface of the fill and the materials being placed shall be maintained within the moisture content range required to permit proper compaction to the specified density with the equipment used. The moisture content shall be controlled in the following manner.

Water may be added to the fill materials in the borrow areas or after the material has been brought onto the fill, whichever is the most practical. When material deposited on the fill is too dry, the Contractor shall be required to sprinkle each layer and obtain uniform moisture distribution in the layer by disking, blading or other approved methods. The amount of water applied shall be controlled so that free water will not appear on the surface during or subsequent to compaction operations.

When either the previously compacted lift or the material deposited on the fill is too wet it shall be removed or spread and permitted to dry, assisted by disking or blading, if necessary, until the moisture content is reduced to the specified limits.

When the top surface of a partial fill becomes too dry or compacted to permit suitable bond with the subsequent layer, the Contractor shall loosen the dried material by scarifying or disking. He shall then moisten the loosened material to an acceptable moisture content and recompact the material to the specified density.

Adjustments of moisture content will be made on the basis of determinations of moisture content by field tests as construction progresses.

5.8.2 Semi-Compacted Fill. The cohesive portion of the fill material shall have a moisture content such that when kneaded in the hand it will form a ball, which does not readily separate when struck sharply with a pencil or which refuses to separate when pressed between the hands. The Contractor may be required to wet or dry the material to obtain the above specified moisture content. When cohesionless material is used no limit will be placed on the moisture content.

5.8.3 Uncompacted Fill. No limit will be placed on the moisture content of uncompacted fill materials except in the event the water content causes deformation of the fill.

5.8.4 Backfill. Backfill materials shall contain the moisture which will permit compaction to the required density as specified in 5.4.2.

5.9 COMPACTION

5.9.1 Equipment. The Contractor shall furnish and operate the necessary types and kinds of equipment to perform the operations required to obtain the compaction specified herein for the type and class of fill included in the contract. The equipment shall be of the capacity, weight and/or power necessary to perform the required operations in a workman-like manner and produce satisfactory progress in construction.

5.9.2 Compacted Fill. After each layer of fill material has been placed, spread and contains the required moisture content specified in 5.8.1, it shall be compacted by passing a roller over the entire surface of the layer a sufficient number of times to obtain the density specified for that particular class of compacted fill.

Portions of the fill which are not accessible to the roller shall be placed in four (4) inch layers and compacted with power tampers to a density equal to that required for other portions of the fill. Densities of compacted fill will be determined by comparing field densities to densities obtained by compacting the same type of soil by "Modified A.A.S.H.O." tests for "Compacted Fill, Class A." or "Proctor" tests for "Compacted Fill, Class B. In no case shall the field densities be less than the required percent of the maximum dry density value as specified in Paragraph 5.4.2 of this specification.

5.9.3 Semi-Compacted Fill. After each layer of fill material has been dumped, spread, and blended, and the moisture content is in accordance with the provisions of 5.8.2, compaction will be obtained by the method specified in Paragraph 5.4.3. The acceptability of "Semi-Compacted Fill: will be based on adherence to the specified procedure.

5.9.4 Uncompacted Fill. No compaction is required other than that obtained by placing, spreading, and dressing the surface area.

5.9.5 Backfill. After each layer of backfill material has been placed and the moisture content is in accordance with the provisions of Paragraph 5.8.4, it shall be compacted with power tampers to the same density requirements as specified in 5.4.2.

5.10 MEASUREMENT AND PAYMENT

All earth fill will be measured between (1) the foundation lines as determined by a cross-section survey after accomplishment of the foundation preparation, scarifying and making any excavation in the embankment foundation area; and (2) the line, grades and slopes of the fill as shown on the drawings or as staked in the field.

Each type of fill will be measured between the type of fill lines as shown on the drawings or as otherwise established. No measurement will be made of additional fill resulting from above-grade tolerance permitted. The volume of each type of fill will be computed to the nearest cubic yard by the method of average cross-sectional end areas. Payment for each type of fill shown in the bid schedule will be made at the contract unit price for that type of fill.

Backfill will be paid for at the contract unit price for compacted fill.

When uncompacted fill is shown on the drawings but not listed in the bid schedule, it will not be paid for as fill but will be handled under Specification 4-58, Excavation.

The payment as specified above shall be considered full compensation for all labor, materials, equipment and incidentals necessary to perform all the operations specified herein.

8A - CONCRETE

8A.1 SCOPE

This specification covers the quality of concrete, the forming, placing, curing and other requirements for concrete construction.

8A.2 COMPOSITION

Concrete shall be composed of cement, fine and coarse aggregates, water and, when specified on the drawings, admixtures other than air entrainment. The material shall meet the requirements of Construction Material Specification 100-58, 101-58, 102-58, and 104-58, respectively. All concrete shall be air-entrained by use of either air-entrained cement or an air-entraining admixture.

8A.3 CLASSIFICATION

Concrete shall be designated on the drawings and/or in the bid schedule as Class A, B, or C and Types I, II, or III, as defined below.

The basis for "Class" of concrete shall be the minimum compressive strength at twenty-eight (28) days, as listed below:

Class	28 Day Compressive Strength Lbs. Per Square Inch
A	3750
B	3000
C	2500
D	2000

The basis for "Type" of concrete shall be its difficulty in forming and placing as stated below:

Type I concrete is intended for use in all heavily reinforced sections which require accurate forming and placement is difficult.

Type II concrete is intended for use in lightly reinforced sections where forming need not be precise and placement may not be difficult.

Type III concrete is intended for use in sections which are not reinforced and placement may not be difficult.

8A.4 QUALITY OF CONCRETE

8A.4.1.Control. The Contractor shall be responsible for the design of the concrete mixtures and the quality of the concrete. Prior to any concrete construction or any change in the mix during construction, the Contractor shall furnish a statement to the Engineer giving the proportions by dry weight of cement, fine and coarse aggregate and quantities of admixtures and water that will be used in the manufacture of each class of concrete contained in the contract. The Contractor shall also submit to the Engineer, laboratory tests made in accordance with paragraph 8A.5 of compressive strength determined by ASTM Designation C 39 at least 10 days before placement of concrete begins..

When truck mixers are used, the Contractor shall submit with each mixer-load a certified delivery ticket giving the quantities of cement, fine aggregate, coarse aggregate, admixtures and water contained in the batch.

8A.4.2.Measurements.. All materials entering into the concrete shall be mechanically measured by weight except the air-entraining admixture and water which may be measured by volume.

8A.4.3.Aggregate Content. Concrete mixtures will be designed to use the maximum size of coarse aggregate of 1-½ inches unless otherwise specified in the drawings.

8A.4.4.Entrained Air Content. The air content shall be between three (3) and six (6) percent of the volume of the concrete.

84.4.5.Water Content. The water content of all concrete mixtures will be the minimum necessary to properly place the mixture being used.

8A.5 STRENGTH TESTS

Standard tests of the strength of the concrete may be made by the Engineer at any time he elects to do so. Samples of concrete will be obtained in accordance with the "Standard Method of Sampling Fresh Concrete", ASTM Designation C 172. Compression test specimens will be made in accordance with the "Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field", ASTM Designation C 31. Compression tests will be made in accordance with the "Standard Method of Test for Compressive Strength of Molded Concrete Cylinders", ASTM Designation C 39.

For a 28-day strength test, three (3) standard test specimens shall be made from a composite sample of concrete taken from the transportation unit at the point of discharge. The test result shall be the average of the strengths of the three specimens, except that, if one specimen in a test shows manifest evidence of improper sampling, molding, or testing, it shall be discarded and the remaining two strengths averaged. Should more than one specimen representing a given test show definite defects, due to improper sampling, molding or testing, the entire test shall be discarded.

The Engineer will ascertain and record the batch number for the concrete and the exact location in the work at which each batch represented by a strength test is deposited.

8A.7 CONSISTENCY

The consistency of any concrete shall be such that it can be worked readily into the corners and angles of the forms and around reinforcement with the method of placing employed on the work, but without permitting the materials to segregate or excess free water to collect on the surface. The following ranges represent the extreme limits of allowable slump when tested in accordance with the "Test for Slump of Portland Cement Concrete:, ASTM Designation C-143.

Class of Concrete	Slump Range (Inches)
Class A	1-½ to 3
Class B	1-½ to 4
Class C	1-½ to 4
Class D	1-½ to 6

8A.8 BATCHING AND MIXING

8A.8.1. Equipment. If the concrete is batched and mixed at the site, the Contractor shall provide a modern and dependable batch-type mixing plant with a capacity consistent with the size of the job. The equipment shall be capable of combining the aggregate, cement and water into a uniform mixture and of discharging this mixture without segregation. Adequate facilities shall be provided for the accurate measurement and control of each of the materials entering the concrete. The complete plant assembly shall include provisions to facilitate the inspection of all operations at all times.

Ready-mixed concrete may be used if approved by the Engineer. All mixing requirements specified herein for concrete mixed at the site shall be applicable to ready-mixed concrete. The Engineer shall have free access to the mixing plant at all times.

Truck mixers will be allowed, provided the use of this method will cause no violation of any applicable provisions of specifications for concrete contained herein. Truck mixers, unless otherwise authorized by the Engineer, shall be of the revolving drum type, water-tight, and so constructed that the concrete can be mixed to insure the uniform distribution of materials throughout the mass. Each truck mixer shall be equipped with a tank of known capacity which shall be equipped with an accurate device for measuring the amount of water added. Truck mixers and agitators shall be operated within the limits of capacity and speed of rotation designated by the manufacturer of the equipment.

8A.8.2. Mixing Time. Neither the speed nor the volume capacity of the mixer shall exceed those recommended by the manufacturer. Excessive overmixing, requiring additions of water to preserve the required consistency will not be permitted. The mixing time for each batch, after all solid materials are in the mixer drum, provided that all the mixing water shall be introduced before one-fourth (¼) of the mixing time has elapsed, shall be no less than 1-½ minutes for mixers having capacity up to two (2) cubic yards. For mixers of larger capacities, this minimum shall be increased fifteen (15) seconds for each cubic yard or fraction thereof of additional capacity. When a truck mixer is used, each batch of concrete shall be mixed not less than fifty (50) nor more than one hundred (100 revolutions at a mixing speed of not less than four (4) r.p.m. after all materials are in the mixer drum.

8A.9 CONVEYING

Concrete shall be conveyed from mixer to forms as rapidly as practicable by methods which will prevent segregation or loss of ingredients. There shall be no vertical drop greater than five (5) feet except where suitable equipment is provided to prevent segregation and where specifically authorized.

No concrete shall be placed until the Engineer has given his approval of the subgrade, forms and reinforcing steel in place. No concrete shall be placed except in the presence of the Engineer and the Contractor shall give reasonable notice of his intention to pour.

8A.10 PLACING

8A.10.1General. All concrete will be placed in forms in accordance with Section 8A.15of this specification. Concrete shall be worked into the corners and angles of the forms and around all reinforcements and embedded items without permitting the materials to segregate. Concrete shall be placed within one (1) hour after the introduction of the water to the cement and aggregates. Concrete shall be deposited as close as possible to its final position in the forms. The depositing of concrete shall be regulated so the concrete may be effectively compacted with a minimum lateral movement. Concrete shall be consolidated with the aid of mechanical vibrating equipment supplemented by hand-spading and tamping. Vibrating equipment shall be of the internal type and shall at all times be adequate to properly consolidate all concrete. All concrete placing equipment and methods shall be subject to approval of the Engineer.

8A.10.2. Lifts in Concrete. Unless otherwise shown on the drawings, the permissible depth of concrete placed in each lift shall not be limited. All concrete shall be deposited in horizontal layers approximately twenty (20) inches in thickness unless otherwise authorized or directed. Each layer shall be well worked into the preceding layer while both are still soft. If a delay occurs in excess of a forty (40) minute interval between any two (2) consecutive batches or loads, or in case of any delay between placing of batches that allows previously placed concrete to take initial set, the Contractor shall discontinue the placing of concrete and make, at his own expense, a construction joint satisfactory to the Engineer before proceeding with the placing operations. He shall remove whatever portion of the previously placed concrete that is deemed necessary for the proper formation of the construction joint and no payment shall be made to the contractor for the concrete removed.

8A.10.3 Concrete on Rock Foundation. Rock surfaces upon which concrete is to be placed shall be clean, free from oil, standing or running water, mud, objectionable coatings, debris, loose semi-detached or unsound rock or fragments. Faults or seams shall be cleaned to a depth satisfactory to the Engineer and to firm rock on the sides. Immediately before concrete is placed, all rock surfaces shall be cleaned thoroughly by water under pressure, wet sandblasting, or other means satisfactory to the Engineer. All rock surfaces shall be kept continuously wet for twenty-four (24) hours immediately prior to placing concrete.

8A.10.4. Concrete on Earth Foundations. Unless otherwise authorized, all concrete shall be placed upon clean, damp surfaces free from frost, ice, standing or running water, and never upon soft mud, dried porous earth, or upon fill until specified compaction as shown on the drawings has been obtained.

8A. 10.5. Placing Temperature. Concrete, when deposited in the forms during cold weather, shall have a temperature of not less than 40°F. nor more than 80°F. Heating of mixing water or aggregates will not be permitted until the temperature of the concrete has decreased to 45°F. The materials shall be free from ice, snow, and frozen lumps before entering the mixer. All methods and equipment shall be subject to approval.

8A.11 CONSTRUCTION JOINTS

The placing of concrete will be accomplished so that construction joints occur at locations shown on the drawings or as approved by the Engineer. The type of construction joint will be shown on the drawings. As a lift is completed, the top surface shall be immediately and carefully protected from any condition that will adversely affect the hardening of the concrete. Joints shall be clean and kept damp until the new concrete is placed. Prior to placing the next lift, the joint shall be prepared by brooming a bedding layer of mortar of the same mix as that in the concrete into the old surface after it has been kept moist for several hours unless otherwise permitted.

8A.12 EXPANSION OR CONTRACTION JOINTS

8A.12.1. General. Joints shall be provided at the location indicated on the drawings and according to the details shown or as otherwise approved. The methods and materials used shall be subject to approval and the materials shall conform to the specification applicable. In no case shall any fixed metal, embedded in concrete, be continuous through an expansion or contraction joint, except as specifically detailed in the drawings.

8A.12.2. Expansion Joint Filler. Where indicated on the drawings, expansion joint filler shall be installed using materials of the type and quality indicated and in accordance with Specification No. 106-58, Expansion Joint Filler.

8A.12.3. Waterstops. Waterstops shall be installed in joints as shown on the drawings or as otherwise directed. All joints in metal waterstops shall be brazed or welded. Joints in rubber waterstops shall be cemented or vulcanized as recommended by the manufacturer. Adequate provisions shall be made to support and completely protect the waterstops during progress of the work. The Contractor shall replace or repair, at his own expense, any waterstops punctured, ruptured, or otherwise damaged before final acceptance of the work. Materials from which waterstops are made will be in accordance with Specification No. 107-58, Waterstops.

8A.13. FINISHING

Defective concrete, honeycombed areas, voids left by the removal of tie rods, ridges on all concrete surfaces permanently exposed to view or exposed to water on the finished structure, shall be repaired immediately after the removal of forms unless otherwise authorized or directed. Voids left by removal of tie rods shall be reamed and completely filled with dry-patching mortar. Defective concrete shall be repaired by cutting out the unsatisfactory material and placing new concrete which shall be secured with keys, dovetails, or anchors. Excessive rubbing of formed surfaces will not be permitted. All unformed surfaces of concrete, exposed in the completed work, shall have a wood float finish without additional mortar.

8A.14 CURING AND PROTECTION

. General. All concrete shall be cured for a period of not less than seven (7) consecutive days by one or a combination of the following methods. The curing process shall be done so as to prevent loss of moisture from the concrete for the duration of the entire curing period. Unhardened concrete shall be protected from heavy rains and flowing water. All concrete shall be adequately protected from damage.

8A.14.2. Moist Curing. Concrete shall be moist cured by maintaining all surfaces continuously (not periodically) wet for the duration of the entire curing period. Water for curing shall be clean and free from any elements which will cause staining or discoloration of the concrete. Where forms of wood are used and left in place during curing, the wood shall be kept wet at all times.

8A.14.3. Membrane Curing. The concrete may be cured with a curing compound of the surface membrane type in accordance with specification 105-88, Curing Compounds. Wood forms shall be kept wet until stripped. Formed surfaces shall be thoroughly moistened and the curing compound applied as soon as free water disappears. The curing compound may be applied to unformed surfaces as soon as free water has disappeared. The curing compound shall be applied in a two (2) coat continuous operation by approved spraying equipment and at a coverage of not more than two hundred (200) square feet per gallon for both coats. The second coate shall be applied to overlap the first coat in a direction at approximately right angles to the direction of the first application. Concrete surfaces which are subjected to heavy rainfall within three (3) hours after the curing compound has been applied shall be resprayed by the method and at the coverage herein specified. All concrete surfaces on which the curing compound has been applied shall be adequately protected for the duration of the entire curing period from any damage that would disrupt the continuity of the curing membrane.

8A.14.4. Cold Weather. The air and forms in contact with the concrete shall be maintained at temperatures above forty (40) degrees for at least five (5) days and at a temperature above freezing for the remainder of the specified curing period. Concrete, permitted to be cured with curing compounds, shall be provided the same protection against freezing and low temperatures as provided herein. No open fire shall be permitted within two feet of the concrete at any time.

8A.15 FORMS

8A.15.1. Material. Forms shall be of wood, steel or other approved material, except that natural earth, compacted fill or rock may be used as forms when shown on the drawings or when designated by the Engineer. The type, size, shape, quality and strength of all materials of which forms are made will be subject to approval of the Engineer.

8A.15.2. Construction. Forms shall be true to line and grade, mortar-tight and sufficiently rigid to prevent objectionable deformation under load. The form surfaces shall be smooth, free from irregularities, dents, sags or holes when used for permanently exposed faces. Exposed joints, edges, and external corners shall be finished as indicated on the drawings. Bolts and rods used for internal ties shall be so arranged that when the forms are removed, metal will not be less than one (1) inch from any concrete surface. Wire ties will not be permitted except when approved in writing. When natural earth, compacted fill or rock are to be used as forms, excavation must extend at least 2.5 inches outside the neat lines of the structure.

8A.15.3. Coating. Forms for exposed surfaces shall be coated with an approved non-staining form oil which shall be applied shortly before the concrete is placed. After oiling, surplus oil on the form surfaces and any oil on the reinforcing steel or other surfaces requiring bond with the concrete shall be removed. Forms for unexposed surfaces may be thoroughly wetted in lieu of oiling immediately before the placing of concrete, except that in freezing weather oil shall be used.

8A.15.4. Removal. Forms shall not be removed without approval of the Engineer. All form removal shall be accomplished in such a manner as to prevent injury to the concrete. Forms will not be removed before the expiration of the minimum time indicated below except where otherwise directed or specifically authorized.

Arches, beams and deck-type slabs	7 days
Column and walls	24 hours
Conduits in open cut	72 hours

When conditions on the job are such as to justify the requirement, forms will be required to remain in place for longer periods.

8A.16 EMBEDDED ITEMS

Before concrete is placed, all embedded items will be firmly and securely fastened in place as indicated on the drawings or as required. Embedded items shall be free of oil and other foreign matter.

8A.17 MEASUREMENT AND PAYMENT

Measurement of concrete will be made on the basis of the actual volume of concrete within the neat lines of the structure as indicated on the drawings, or as directed, and will be computed to the nearest one-tenth (1/10) cubic yard. Measurement of concrete placed against the sides of an excavation without the use of intervening forms will be made only within the neat lines of the structure as shown on the drawings and as otherwise authorized in writing. No deductions will be made for rounded or beveled edges or for voids or embedded items which have an internal diameter of six inches or less.

Payment for each class and type of concrete will be made at the contract unit price listed in the bid schedule for each class and type of concrete. Such payment shall be considered full compensation for all labor, materials, equipment and incidentals necessary for the completion of the work specified herein. The furnishing and placing of reinforcing steel is not a part of this specification but will be paid for as specified in Construction Specification 9-58, Placing Steel Reinforcement.

CONSTRUCTION SPECIFICATIONS

9 - PLACING STEEL REINFORCEMENT

9.1 SCOPE

This specification covers cutting, bending and placing steel reinforcement in concrete including bar and mesh reinforcement.

9.2 GENERAL

The reinforcement material shall meet the requirements of construction Material Specification 103-58, Steel Reinforcement.

9.3 BENDING

Reinforcing bars may be mill or field bent. All bends shall be made in accordance with standard approved practice and by approved machine methods. All bends shall be made without heating.

9.4 SPLICING

The length of splices of reinforcing bars shall be as shown on the drawings. When not shown on the drawings, the length of splices shall equal thirty (30) diameters of the smaller bar being spliced. Mesh reinforcement shall be spliced by lapping six (6) inches or two (2) meshes, whichever is greater, and the lapped ends shall be securely wired or clipped together with standard clips.

9.5 SUPPORTS

All reinforcing material shall be secured in place by use of approved metal or concrete supports, spacers and ties. The reinforcing material will be so supported and tied together that it will remain in place throughout the concreting operations. The supports, spacers and ties shall be of a type and used in such a manner that they will not be exposed or contribute in any way to the discoloration or deterioration of the finished concrete surfaces.

9.6 PLACING

When placed and just prior to the concreting operations, all reinforcing material shall be free of loose flaky rust and scale, oil, grease or other coating which might destroy or reduce its bond with concrete. No reinforcing material shall be placed until the subgrade has been approved by the Engineer. No concrete for a pour shall be placed until the placement of the reinforcing material has been inspected and approved for that pour by the Engineer.

9.7 MEASUREMENT AND PAYMENT

The quantity of bar reinforcement will be measured in linear feet for each nominal size as shown on the drawings or otherwise directed for placement. The computed weight of reinforcing bars to be paid for will be based on the unit weights shown in Table 1 of ASTM Designation A-15. The total weight will be computed to the nearest pound. Additional steel reinforcing for laps authorized for the convenience of the Contractor and all material used to fasten all of the reinforcing in place will not be included in the poundage for payment.

The quantity of steel mesh reinforcement shall be measured and computed to the nearest square foot as shown on the plans or otherwise directed for placement.

Payment for bar reinforcement will be made at the contract unit price per pound for Steel Bar Reinforcement.

Payment for mesh reinforcement will be made at the contract unit price per square foot for Steel Mesh Reinforcement.

Such payment or payments shall be considered full compensation for all labor, material, equipment and any incidentals necessary to place the reinforcement as specified herein and as shown on the drawings.

CONSTRUCTION SPECIFICATION

11 - PIPE CONDUITS - REINFORCED CONCRETE

11.1 SCOPE

This specification covers the furnishing and installation of reinforced concrete pipe and fittings including cradling and jointing.

11.2 INSTALLATION

11.2.1 General. The pipes to be installed shall be as called for in the drawings and shall meet material specification 109-58, Concrete Pipe. All pipe shall be inspected for defects by the Engineer immediately prior to placing and shall be laid in his presence.

The contractor shall be required to furnish equipment to apply longitudinal pressure to the pipe in order to secure a tight joint. Such equipment shall be so designed and used that no damage will occur to the pipe joints previously constructed.

11.2.2 BEDDING

(a) Concrete Cradles. The quality, forming, placing and curing of concrete in the cradle shall conform to specification 8A-58, Concrete. The portion of the exterior surface of the pipe that will be in contact with the cradle shall be carefully cleaned with a wet brush immediately prior to placing the concrete. Pipes to be supported by the cradle or encased within it shall be supported by means of precast of "poured in place" concrete blocks.

(b) Concrete Bedding. The bottom of the trench or excavation shall be shaped as shown on the drawings and concrete shall be thoroughly tamped, rodded, or vibrated around the bottom of the pipe.

11.2.3 JOINTING

All joints shall be sealed with a continuous ring rubber gasket supplied by the pipe manufacturer and installed in accordance with his recommendations. All pipe joints shall be inspected after installation and prior to placing any filler material to insure that gaskets are properly seated.

All surfaces which come in contact with rubber gaskets or joint sealing materials shall be cleaned and free from soil particles and all foreign material immediately prior to joining the pipe and placing filler materials.

The type of joint filler material to be used shall be specified on the drawing.

(a) When cement mortar is specified it shall consist of one part Portland cement to two parts clean sand and shall be applied within 30 minutes after mixing with water in a manner recommended by the Engineer. External mortar joints shall be cured in accordance with specification 8A-58, Reinforced Concrete.

(b) When jute and asphaltic joint compound are specified the jute shall be carefully packed around the joint near the rubber gasket with a packing tool to protect it from any possible contact with asphaltic joint compound. Each joint shall be inspected by the Engineer before placing the asphaltic joint compound in place.

11.2.4 ANTI-SEEP COLLARS. The quality, forming, placing and curing of concrete in the anti-seep collars shall conform to specification 8A-58 Concrete. The collar shall be constructed in such a manner that preformed expansion joint filler may be properly placed between the collar and the conduit and cradle to prevent bonding of any part of the anti-seep collar to the pipe or cradle.

11.2.5 WALL FITTING. A wall fitting of special design as shown on the drawings shall be installed in the wall of the riser during its construction to connect the reinforced concrete pipe to the riser.

11.3 MEASUREMENT AND PAYMENT

The method of payment for all concrete in concrete cradles, concrete bedding and anti-seep collars shall conform to specification 8A-58, Concrete.

The unit of measurement for reinforced concrete pipe shall be linear feet and tenths thereof of pipe in place measured along the centerline of the pipe between the upstream end of the special wall fitting in the riser and the shoulder of the male connection of the last pipe length downstream. Payment shall be made at the contract unit price per linear foot for Reinforced Concrete Pipe and shall be full compensation for all pipe, and elbrows, special wall fittings, rubber gaskets, jointing materials, labor, equipment and incidental work required in the installation of the conduit.

CONSTRUCTION SPECIFICATION

13 - STRUCTURE DRAINAGE

13.1 SCOPE

This specification covers the installation of foundation blanket drains, foundation trench drains, toe drains and wall drains.

13.2 DEFINITIONS

13.2.1 Foundation Blanket Drain. A foundation blanket drain consists of a layer of porous material, usually sand and gravel, spread over a portion of the foundation area of an embankment and may extend up the abutments.

13.2.2 Foundation Trench Drains. A foundation trench drain is a constructed trench that is backfilled or partially backfilled with porous material, usually sand and gravel. A trench drain may consist solely of porous material or it may also contain a porous or perforated pipe.

13.2.3 Toe Drain. A toe drain is located in the downstream toe of an embankment and may consist of rock and/or sand and gravel. A toe drain may consist solely of porous material or it may also contain a porous or perforated pipe.

13.2.4 Wall Drains. A wall drain consists of a porous material, usually sand and gravel, that is placed adjacent to a structure wall to collect and facilitate drainage through weep hole in the structure wall. A wall drain may or may not include a collector pipe.

13.2.5 Tile Drain. A tile drain consists of drain tile or perforated pipe placed in an excavated trench. The tile or pipe may be bedded in or backfilled with a porous material.

13.3 FILTER MATERIAL

Filter material shall be composed of tough, hard, durable rock or particles, shall be reasonably free from thin, flat, and elongated pieces. It shall be free of organic matter and soft friable particles in quantities considered objectionable. Filter material shall consist of well graded sand, sand and gravel, gravel, crushed rock, or rock and shall conform to the gradations or mixtures shown on the drawings or in the special specifications.

The Contractor shall designate to the Engineer the source of the filter material for his approval at least ten (10) days prior to the delivery of any such material to the site of the work.

13.4 INSTALLATION

13.4.1 General. If pipe within the drain is indicated on the plans, the pipe shall be placed in the filter material at the locations, elevations, lines or grades shown. The kind, diameter, length, strength or gage and coating of the pipe shall be in accordance with the drawings or special specifications.

The foundation area for the filter layers shall be shaped and dressed to the slope lines and grades shown on the drawings. No filter material shall be placed until the foundation area has been inspected and approved by the Engineer.

The filter material shall be placed to the neat lines shown on the drawings or as directed by the Engineer. The material shall be placed in such a maner as to avoid the segregation of particle sizes within the filter and to avoid mixing the filter material with the foundation material. Any damage to the surface of the foundation area during placement of the filter shall be repaired before proceeding with the work. Filter will be placed and finished to an even surface free of mounds and windrows. When compaction of these materials is required, it shall be indicated on the drawings.

The upper ends of all pipe in foundation drains shall be closed as shown on the drawings. If metal caps are used, the caps shall be so installed as to have a positive connection with the pipe to prevent its displacement during backfilling operations and thereafter. The outlet end of the pipe shall have an animal guard as shown on the drawings.

13.4.2 Corrugated Metal Pipe. The separate sections of pipe and fittings shall be joined firmly together with coupling bands held in place with bolts.

The coupling bands, elbows and tees shall be the same gage as the pipe with which they are used.

After the pipe, fittings and connections have been completely installed and while still exposed, any points where the bituminous coating has been broken sufficiently to expose the base metal shall be repaired by recoating with asphalt material similar and equal to that used in the original bituminous coating.

Perforated corrugated metal pipe shall be laid with the perforations down and symmetrical about a vertical centerline.

Just prior to the placement of the perforated pipe in its final position, the perforations (holes) shall be thoroughly cleaned by removing all excess material, bituminous and other, from each perforation.

When using standard corrugated matal pipe, the pipe shall be laid with the outside laps of circumferential joints pointing upstream, and with longitudinal laps on the sides.

When the drawings show standard or helical perforated corrugated metal pipe connecting with non-perforated standard or helical corrugated metal outlet pipe, a tee or elbow connection shall be provided and installed at the location shown on the drawing.

13.4.3 Fiber Pipe. Standard couplings shall be used to connect both the perforated and non-perforated fiber pipe.

13.4.4 Clay and Concrete Pipe. The pipe shall be laid with the bells pointing upstream to the direction of flow.

Perforated pipe shall be laid with perforations down and symmetrical about a vertical centerline. Perforated holes shall be thoroughly cleaned of mud or dirt before laying.

13.4.5 Blanket Foundation Drains and Toe Drains. Filter material used in blanket foundation drains or toe drains shall be placed in eight (8) inch deep horizontal layers. Each layer shall be consolidated by routing hauling equipment so that at least two-thirds of the surface area is traversed by the tires of the equipment or by two passes of a pneumatic roller. Areas of gravel inaccessible to large equipment shall be consolidated by manually operated pneumatic tampers or other means approved by the Engineer.

When rock is used in the toe drains, the material shall be placed in horizontal layers about twelve (12) inches thick and consolidated by the travel of hauling equipment over each layer.

13.4.6 Foundation Trench Drains. The filter material shall be placed in the trench by methods that will eliminate mixing earth with the filter material.

When the top of the foundation trench drain is below the ground line, the Contractor shall backfill the trench to the ground line with the class of embankment shown on the drawings. Payment will not be made for this backfill as such but shall be considered a subsidiary of this specification.

13.4.7 Wall Drains. A piece, one (1) foot square, of four by four (4x4) hardware cloth, sixteen (16) square openings to the square inch, manufactured with twenty-three (23) gage galvanized wire shall be furnished and placed between the porous gravel filter material and each weep hole where porous concrete material is not called for on the drawings.

If porous concrete is called for, the concrete material shall consist of coarse aggregate retained on a No. 4 sieve, cemented together with neat cement forming a rigid and porous drain. This material shall be placed at weep holes if so indicated on the drawings.

13.5 MEASUREMENT AND PAYMENT

The volume of filter material placed will be determined by the method of average end areas. End areas of sections shall be computed as follows: Surveys will be made after the foundation is prepared and prior to placement of materials. The areas will be computed using the survey of the prepared foundation and the neat lines of filter material indicated on the drawings, or as modified by the Engineer.

Payment for filter material will be made at the contract unit price per cubic yard for "Filter Material." Payment for pipe will be made at the contract unit price per linear foot for the corresponding type, kind, size and grade of pipe as listed in the bid schedule. Such payment shall be full compensation for all labor, materials, equipment, and incidentals required to construct the drains as shown on the drawings and specified herein, including the required excavation and backfill.

CONSTRUCTION SPECIFICATION

14 - METAL FABRICATION AND INSTALLATION

14.1 SCOPE

This specification shall apply to furnishing material, fabrication, installation and painting of all metal structures in accordance with the plans including the metal part of composite structures involving other materials, except steel reinforcing bars. Typical structures covered under this specification are Trash Racks, Manhole Assemblies, etc.

14.2 MATERIALS

All structural shapes, rods, and plates shall be of structural steel or wrought iron, as specified or indicated on the drawings, meeting the respective requirements prescribed under 112-58, Wrought Iron and Steel Pipe and Fittings, Specification 117-58, Structural Metal. When galvanizing is specified on the drawings it shall be done as prescribed in Specification 119-58, Galvanizing.

14.3 WORKMANSHIP AND FINISH

The workmanship and finish shall be first class and equal to the best practice in modern metal fabrication shops. Welding, shearing, burning and chipping shall be neatly and accurately done and all portions of the work exposed to view shall be neatly finished.

14.4 BOLTED CONNECTIONS

Bolted connections shall not be used unless shown on the plans. Holes shall be drilled 1/16 inch larger than the nominal diameter of the bolts unless otherwise specified. Holes shall be at right angles to the surface of the metal so that both head and nut will bear squarely against the metal. When bolts are to be used in beveled surfaces, beveled washers shall be provided to give full bearing to the head or nut.

Bolts shall extend entirely through their nut but not more than one-fourth (1/4) inch beyond after the nuts are tightened.

14.5 RIVETED CONNECTIONS

Pneumatic hammers shall be used for field riveting except when the use of hand tools is permitted. Rivets larger than 7/8 inch in diameter shall not be driven by hand.

Connections shall be accurately and securely fitted before the rivets are driven. Light drifting will be permitted to draw the parts together. In driving, rivets shall be upset to completely fill the holes. Rivets shall be tight and grip the connecting parts securely together.

14.6 WELDING

Welding shall be done only where called for on the drawings. Welding will not be accepted as a substitute for riveting or bolting. All welding shall be done by qualified welders.

Each welded joint shall be electric arc welded with one-fourth (1/4) inch fillet, butt or bead welds.

Welding electrodes shall comply with the requirements of the Standard Specifications for Mild Steel Arc-Welding Electrodes, ASTM Designation A-233, except that they shall be uniformly and heavily coated (not washed) and shall be of such nature that the coating will not chip or peel while being used with the maximum amperage specified by the manufacturer.

In welding metal which is to be galvanized, bare electrodes shall be used, unless otherwise specified.

All aluminum welds shall be made with welding rods conforming to the requirements of Federal Specification QQ-R-566 for Rods, Welding, Aluminum and Aluminum Alloys Type I, Class FS-RAI-43.

14.7 PAINTING

Unless galvanized or otherwise specified on the drawing, all steel shall be painted with three (3) coats of commercial grade paint. The first coat shall be of red-lead paint. The second coat shall be of red-lead paint, tinted light brown with lamp-black in an amount not more than one-fourth (1/4) pound per gallon of linseed oil. The third coat shall be of aluminum paint.

Immediately prior to the application of the first coat of paint, the surfaces of metal to be painted shall be thoroughly cleaned, removing rust, loose mill scale, dirt, oil or grease and other foreign substances and shall be dry.

Prior to the application of the second and third coats, the paint shall be dry and hard and shall be cleaned of all dirt, oil and grease and shall have a dry surface.

The paint shall be thoroughly mixed or stirred immediately before applying in order to keep the pigments in uniform suspension.

The coating of paint applied shall be smoothly and uniformly spread so that no excess paint will collect at any point. On all surfaces which are inaccessible for paint brushes the paint shall be applied by spraying or by sheepskin daubers. If the painting is unsatisfactory to the Engineer, the paint shall be removed and the metal thoroughly cleaned and repainted.

Paint shall not be applied when the air temperature is below forty (40) degrees F. or when the air is misty, or when, in the opinion of the Engineer, conditions are otherwise unsatisfactory for the work.

It shall not be applied upon damp or frosted surfaces.

Material painted under cover in damp or cold weather shall remain under cover until dry or until weather conditions permit its exposure in the open. Painting shall not be done when the metal is hot enough to cause the paint to blister and produce a porous paint film.

14.8 MEASUREMENT AND PAYMENT

Payment for fabrication and installation of metal work will be made at the contract lump sum prices. Such payment shall include full compensation for furnishing all material, fabricating, painting, erecting and incidental work necessary to the installation of the finished metal work in place.

CONSTRUCTION SPECIFICATION

17 - ROCK RIPRAP

17.1 SCOPE

This specification covers the foundation preparation and placing of rock riprap.

17.2 GENERAL

When filter blankets are required they will be shown on the drawings and shall conform to Specification 7-58, Filters.

17.3 MATERIALS

The riprap stone shall be durable and of a suitable quality to assure permanence in the climate in which it is to be used. The stone shall be sound and dense, free from seams of soft materials and other defects that would tend to increase deterioration from weathering, freezing, and thawing, or other natural causes. Riprap shall be reasonably well graded from the minimum size to the maximum size stone as shown on the drawings. Rock fragments or spalls shall be used to fill the voids between the larger rocks.

The inclusion of appreciable quantities of dirt, sand, clay and rock fines will not be permitted. All rock considered for use as riprap shall have prior approval by the engineer before delivery to the site.

17.4 CONSTRUCTION

17.4.1 Foundation Preparation. Earth surfaces on which the filter blanket or rock riprap is to be placed shall be trimmed and graded to conform to the lines of sections shown on the drawings. Prior to placing the rock riprap, the prepared earth foundation will be inspected, and no materials shall be placed thereon until approved by the engineer.

17.4.2 Riprap. Dumped riprap composed of stone conforming to the requirements of this specification will be placed by equipment on the surfaces and to the depths indicated on the drawings or as staked on the ground. The riprap shall be placed to the full course thickness at one operation and in such manner as to avoid serious displacement of the underlying materials. The riprap shall be delivered and spread so that the mass of stones in place shall be reasonably well graded, with the larger rocks uniformly distributed and the smaller rocks and spalls filling the voids between the larger rocks. The finished riprap shall be free from objectional concentrations of large or small stones. A tolerance of +12 inches or -6 inches from slope lines and grades shown on the drawings shall be allowed in the finished surface of the riprap, except that the extreme minus tolerance shall not be continuous over an area exceeding 200 square feet. Placing riprap by dumping into chutes or by other means that are likely to cause segregation of the various sizes will not be permitted. The contractor shall maintain the riprap protection until it has been accepted, and any materials displaced by any cause shall be replaced at the contractor's expense to the lines and grades shown on the drawings.

When hand-placed riprap is called for on the drawings, riprap composed of stone conforming to the requirements of the specification shall be placed by hand on the surfaces and to the depths indicated on the drawings or as staked on the ground. The riprap shall be placed in such manner that adjacent stones are in close contact and in general have the greatest dimension across the slope. Spaces between the larger stones shall be filled with the smaller stones of acceptable size. The smaller stones shall not be grouped to serve in place of the larger size stone. Flat slab rocks shall be laid on edge. A tolerance of +12 inches or -6 inches from the slope lines and grades shown on the drawings will be allowed in the finished surface of the riprap, provided the minus tolerance is not continuous over an area greater than 200 square feet.

17.5 MEASUREMENT AND PAYMENT

The work will be measured by the actual number of square yards, to the nearest one-tenth (1/10) sq. yd. measured in place parallel to the face of the riprap as indicated on the drawings. Payment will be made at the contract unit price per square yard for riprap, and shall be considered full compensation for all labor, material, equipment and incidentals necessary for the completion of the work specified herein.

When "Rock Riprap" is not shown as a separate item in the contract, the price for such work specified herein shall be a subsidiary of the other items and no separate payment will be made for "Rock Riprap" as such.

CONSTRUCTION SPECIFICATION

18 - GATES AND VALVE INSTALLATION

18.1 SCOPE

This specification covers the installation of valves and gates, including hoists, rods, seals and other appurtenant apparatus necessary to their installation and operation.

18.2 VALVES, GATES AND HOISTS

Valves, gates, hoists and other appurtenances shall be equal to the manufacturer's model or models designated on the drawings and shall comply with the style, size, strength (working head and seating pressure), shape and end connection shown on the drawings. They shall be an approved standard product from a reputable manufacturer and shall be manufactured to the standards of commercial equipment to facilitate assembly, installation, repair and replacement. The gates and hoists shall be completely assembled in the factory and shall be dismantled only as required for shipment. Where necessary to facilitate assembly in the field, they shall be marked and match-marked, and erection diagrams and templets for anchor bolts shall be furnished. All gates shall be supplied complete with all necessary lifting devices for the operation of the gates unless indicated otherwise on the drawings. The slide gates and flap gates shall be supplied attached to corrugated metal pipe or provided with anchor bolts for attachment to the inlet in accordance with the drawings. Appurtenances required in this installation such as encasement pipe, metal work, etc. not usually associated with a manufacturer's model will be shown on the drawings and shall meet the applicable specification such as specification No. 112-58, Wrought Iron, Steel, Cast Iron and Copper Pipe and fittings; No. 117-58, Structural Metal, and No. 119-58, Galvanizing.

Painting of galvanized and non-ferrous metal surfaces will not be required. All other surfaces of valves, gates, hoists and appurtenant metal work shall be painted one shop coat at the factory. The shop coat shall be in accordance with the manufacturer's standard practice for painting.

18.3 INSTALLATION

Valves, gates and appurtenances shall be carefully installed in conformance with the manufacturer's instructions and as shown on the drawings. Surfaces of all metal against which concrete will be poured shall be unpainted and free from all oil, grease, dirt, loose mill scale and flaky rust. Two additional coats of paint in addition to the shop coat shall be applied in the field in accordance with the specification for painting in Specification 14-58, Metal Fabrication and Installation.

18.4 MEASUREMENT AND PAYMENT

The unit of measurement for valves, gates and their appurtenances will be the number of each type, size and model designation. Payment will be made at the contract unit price for each type, size and model designation of valves, gates and their appurtenances, (including encasement pipes, or other items), shown on the drawings and listed in the bid schedule.

Such payment shall be considered full compensation for all labor, materials, equipment and any incidentals required to install the gates and valves and their appurtenances as shown on the drawings and specified herein.

CONSTRUCTION SPECIFICATION

20 - SALVAGING AND PLACING TOPSOIL

20.1 SCOPE

This specification covers the removal, temporary stockpiling, the loading, transporting, depositing, and spreading selected topsoil on designated areas and/or finished slopes.

20-2 MATERIAL

Material for this item shall be obtained from excavated areas, areas upon which embankments shall be placed, or other designated areas.

20.3 CONSTRUCTION METHODS

Trash, wood, brush, stumps, roots, rocks over six (6) inches in diameter, and other objectionable material encountered shall be removed and disposed of, as specified under paragraph 1-4, Specification 1-58, Clearing or Paragraph 2.5 of Specification 2-58, Clearing and Grubbing, prior to the beginning of work required by this item. The top soil will be stockpiled on areas mutually satisfactory to the Contractor and the engineer in neat, uniform windrows or piles to facilitate their measurement before spreading. All topsoil salvaged shall be spread on the areas and/or finished slopes to a depth as shown on the drawings, or as designated by the engineer. After the spreading of topsoil all large stiff clods, hard lumps, large stones, trash, wood, brush, stumps, roots or other objectionable material shall be gathered up, removed from the topsoiled area and disposed of as specified under Paragraph 1.4 of Specification 1-58, Clearing, or Paragraph 2.5 of Specification 2-58, Clearing and Grubbing.

20.4 MEASUREMENT AND PAYMENT

Salvaging and placing topsoil will be measured for payment on the basis of number of cubic yards of topsoil material acceptably placed on the structure at the location(s) shown on the drawings or as designated by the engineer. Cross sections will be taken of the stockpiles (1) before any material is placed, and (2) after placing of the required topsoil, but before the leveling of the excess. The volumes computed from this data using the method of average end areas shall be used as the volume of material.

Payments on the volume as computed above and at the contract unit price per cubic yard for "Salvaging and Placing Topsoil" shall constitute full payment of removing, temporary stockpiling, loading, depositing and spreading topsoil, and for all labor, tools, and incidentals necessary to complete the work as herein specified.

23 - ESTABLISHING VEGETATION

23.1 SCOPE

This specification covers the furnishing of all labor, equipment and materials, and performing all operations in connection with soil preparation, liming, fertilizing, seeding, and mulching of the embankment, spillway, and exposed soil areas disturbed during construction. Approximate areas to be treated will be shown on the drawings and shall be staked or otherwise designated by the engineer.

23.2 SEEDBED PREPARATION AND SEEDING

Lime shall be uniformly applied to the areas to be seeded at a rate of not less than two (2) tons per acre.

Fertilizer shall be uniformly applied to the areas to be seeded at a rate of not less than one thousand (1,000) pounds per acre.

The lime and fertilizer shall be thoroughly mixed into the upper three (3) to six (6) inches of topsoil; except that when hydro-seeding techniques are employed, the fertilizer may be applied in solution with the seed without further mixing with the soil.

A fine, firm seedbed shall be prepared free of clods or other surface obstructions. The final tillage operation prior to seeding shall be cultipacking or rolling, except that cultipacking or rolling will not be required where slopes are encountered that make the power operation of this type of equipment impractical, as determined by the Engineer. No seeding shall be performed prior to inspection and approval of the seedbed by the Engineer.

Seed mixtures, including quantities, species, varieties, strains, and special seed treatments shall be as designated on the drawings.

Seeding shall be carried out during the period August 1 to October 1, except as otherwise approved by the Engineer.

Seed shall be distributed on the soil surface uniformly over the areas seeded.

The area shall be cultipacked or rolled after seeding; except where slopes are encountered that make the power operation of this type of equipment impractical as determined by the Engineer; or except when hydro-seeding techniques are employed.

23.3 MULCHING AND OTHER PROTECTION MEASURES

23.3.1 Mulching. As designated in the plans, mulch shall be applied to seeded areas at the rate of not less than one (1) nor more than one and one-half (1 1/2) tons of mulch per acre. The mulch shall be uniformly distributed. When designated on the plans, the mulch shall be anchored by cutting it slightly into the soil surface with a disc harrow or equivalent suitable equipment as approved by the Engineer.

23.3.2 Anchoring Mulch with Paper Twine Fabric. When designated on the plans, the mulch shall be covered with paper twine fabric, applied in accord with the manufacturers' instructions.

23.3.3 Jute Netting. Jute netting shall be applied to areas as designated in the plans. The soil surface shall be prepared and the jute applied and anchored in accord with manufacturers' instructions. Following the application of the jute, the juted area shall be over-seeded at not less than one-half (1/2) the rate specified for the seeding for the area.

23.4 MEASUREMENT AND PAYMENT

23.4.1 Seedbed Preparation and Seeding. The area seeded shall be measured to the nearest one-tenth (0.1) acre. Payment will be made at the contract unit price per acre for "Seedbed Preparation, Seeding, Liming and Fertilizing". Such payment shall constitute full compensation for all labor, materials, supplies, equipment and incidentals necessary to complete this item.

23.4.2 Mulching and Other Protection Measures.

23.4.2.1 Mulching. The quantity of mulch applied shall be measured to the nearest one-tenth (0.1) ton. Payment will be made at the contract unit price per ton for "Mulching". Such payment shall constitute full compensation for furnishing all labor, materials, supplies, and equipment necessary to complete this item.

23.4.2.2 Paper Twine Fabric. The quantity of paper twine fabric applied shall be measured to the nearest one (1) square yard. Payment will be made at the contract unit price per square yard for "Anchoring Mulch with Paper Twine Fabric". Such payment shall constitute full compensation for furnishing all labor, materials, supplies, equipment and incidentals necessary to complete this item.

23.4.2.3 Jute Netting. The quantity of jute netting applied shall be measured in place to the nearest one (1) square yard. Payment will be made at the contract unit price per square yard for "Jute Netting". Such payment shall constitute full compensation for furnishing all labor, materials, supplies, equipment and incidentals necessary to complete this item.

CONSTRUCTION MATERIAL SPECIFICATION

100 - CEMENT

100.1 SCOPE

This specification covers the requirements of Portland cement with or without air-entrainment.

100.2 QUALITY

100.2.1 Portland Cement (Type I). Portland cement, Type I, shall meet the requirements of ASTM Designation C-150.

100.2.2 Air-Entraining Portland Cement (Type IA). Air-entraining Portland cement, Type IA, shall meet the requirements of ASTM Designation C-175 for the type of cement specified.

100.3 STORAGE OF CEMENT

Cement shall be properly stored and protected from weather, dampness or other destructive agencies and any cement which is damaged will be rejected and not permitted to be used in the work.

100.4 SAMPLING AND TESTING

Portland cement, Type I, shall be subject to sampling and testing in accordance with ASTM Deisgnation C-150.

Air-entraining Portland cement, Type IA, shall be subject to sampling and testing in accordance with ASTM Designation C-175.

CONSTRUCTION MATERIAL SPECIFICATION

101 - AGGREGATES

101.1 SCOPE

This specification covers the requirements of fine and coarse aggregates used in making concrete.

101.2 FINE AND COARSE AGGREGATES

Fine and coarse aggregates shall conform to the provisions of ASTM Designation C-33, Concrete Aggregates.

101.3 STORAGE

Aggregates shall be stored in such a manner as to avoid the inclusion of any foreign material in the concrete. The storage piles shall be constructed so as to prevent segregation. The deposition of material in storage and its removal therefrom shall be done in such a manner to increase the uniformity of the grading insofar as is practicable. All fine aggregate shall remain in free drainage storage for at least seventy-two (72) hours prior to use.

101.4 SAMPLING AND TESTING

When testing is required, the sampling shall be done in accordance with, and the testing results conform to the above ASTM Standards and the references contained therein. The source from which the aggregates are to be obtained shall be selected well in advance of the time when the material will be required in the work. Samples of the aggregates when requested, shall be furnished at least fifteen (15) days in advance of the time when the placing of concrete is expected to begin. Unless otherwise specified, all test samples shall be taken under the supervision of the Engineer and delivered to the designated point by the Contractor at his expense. All required tests will be made by and under the supervision of the Engineer. The Contractor shall provide such facilities as the Engineer may consider necessary for the ready procurement of representative test samples.

CONSTRUCTION MATERIAL SPECIFICATION

102 - WATER

102.1 SCOPE

This specification covers the requirements for water used in making concrete and mortar, washing aggregates and curing concrete.

102.2 QUALITY

Water used for washing aggregates, mixing concrete or mortar and curing concrete shall be clean, free from injurious amounts of oil, acid, salts, alkalies, organic matter, sewage, or other deleterious substances.

102.3 INSPECTION AND TESTING

The water used for the purposes mentioned above shall be subject to approval by the Engineer.

CONSTRUCTION MATERIAL SPECIFICATION

103 - STEEL REINFORCEMENT

103.1 SCOPE

This specification covers the requirements for steel reinforcement used in concrete.

103.2 QUALITY

103.2.1 Deformed Bars. Bars shall comply with the Standard Specifications for Billet Steel Bars for Concrete Reinforcement, ASTM Designation A-15 and shall be deformed bars of intermediate grade made by the open-hearth process. All bars shall be rolled so as to comply with the requirements of the Standard Specifications for Minimum Requirements for the Deformation of Deformed Steel Bars for Concrete Reinforcement, ASTM Designation A-305.

103.2.2 Welded Wire Fabric. Welded wire fabric shall comply with the Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement, ASTM Designation A-185.

103.3 INSPECTION AND SAMPLING

When requested, the Contractor shall secure from the manufacturer, and furnish in duplicate, certified copies of the mill test report for each delivery of bar reinforcing steel to the job. The bars shall be properly tagged so as to permit identification of the heat number shown on the mill test report for any and all steel delivered to the work.

103.4 STORAGE

Steel reinforcement shall be stored above the surface of the ground upon platforms, skids, or other supports and shall be protected, as far as practicable, from mechanical injury and surface deterioration caused by conditions producing rust.

103.5 TESTS

When tests are required, reinforcement will be tested in accordance with the above ASTM Specification for each class, except that tensile tests shall comply with the Standard Methods of Tension Testing of Metallic Materials, ASTM Designation E-8.

CONSTRUCTION MATERIAL SPECIFICATION

104 - AIR-ENTRAINING ADMIXTURES

104.1 SCOPE

This specification covers air-entraining agents added to the concrete mixtures.

104.2 ADMIXTURES

The air-entraining admixtures shall fully meet the requirements of ASTM Designation C-260, Air-Entraining Admixtures for Concrete.

104.3 TESTING

The properties of the admixture enumerated in ASTM Designation C-260 shall be subject to tests in accordance with ASTM Designation C-233, Testing Air-Entraining Admixtures for Concrete.

CONSTRUCTION MATERIAL SPECIFICATION

105 - CURING COMPOUNDS

105.1 SCOPE

This specification covers the requirements for liquid-membrane-forming compounds suitable for spraying on concrete surfaces to retard the loss of water during the curing process.

105.2 QUALITY

The curing compound shall conform to ASTM Designation C-309, Liquid Membrane-Forming Compounds for Curing Concrete.

Unless otherwise specified the compound shall be the clear or translucent type and shall contain a fugitive dye to assist in securing uniform coverage.

105.3 DELIVERY AND STORAGE

All curing compound shall be delivered to the site of the work in the original sealed container bearing the name of the manufacturer, the brand name and the manufacturer's batch number. The condition of the compound shall be approved prior to use.

105.4 TESTING

When required, testing of curing compounds shall be done in conformance with ASTM Designation C-156.

CONSTRUCTION MATERIAL SPECIFICATION

106 - EXPANSION JOINT FILLER

106.1 SCOPE

This specification covers expansion joint fillers for concrete for the following types: Bituminous Type, and Non-Extruding Resilient Types.

106.2 BITUMINOUS TYPE

This expansion joint filler shall conform to ASTM Designation D-994 for Preformed Expansion Joint Filler for Concrete, (Bituminous Type).

106.3 NON-EXTRUDING AND RESILIENT TYPES

This expansion joint filler shall conform to ASTM Designation D-544 for Preformed Expansion Joint Filler for Concrete, (Non-Extruding and Resilient Types).

106.4 TESTS

When tests are required, they shall be made in conformance with the references included in the applicable ASTM Designations cited in this specification.

CONSTRUCTION MATERIAL SPECIFICATION

107 - WATERSTOPS

107.1 SCOPE

This specification covers the materials from which waterstops may be fabricated or premolded. The materials covered are copper, steel, wrought iron, plastic material and rubber.

107.2 COPPER

Copper used for waterstops shall conform to ASTM Designation B-248 for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar.

107.3 STEEL

Steel used for waterstops shall conform to ASTM Designation A-366 for Cold Rolled Carbon Steel Sheets, Commercial Quality or ASTM Designation A-93 for Zinc Coated (Galvanized) Iron or Steel Sheets, Coils, and Cut Lengths.

107.4 WROUGHT IRON

Wrought iron used for waterstops shall conform to ASTM Designation A-162 for Uncoated Wrought Sheets or ASTM Designation A-163 for Zinc Coated (Galvanized) Wrought Iron Sheets.

107.5 PLASTIC

Plastic material used for waterstops shall conform to ASTM Designation D-742 for Vinyl Chloride-Acetate Resin.

107.6 RUBBER

The rubber waterstop material shall meet the following physical requirements when tested in accordance with the appropriate sections of Federal Specification ZZ-R-601, ASTM Designation D-395 and ASTM Designation D-676:

107.6.1 Hardness. The Shore A durometer hardness shall be 60 to 70.

107.6.2 Elongation. The elongation shall be a minimum of 400 percent.

107.6.3 Tensile Strength. The tensile strength shall be a minimum of 2500 pounds per square inch.

107.6.4 Water Absorption. The water absorption shall be a maximum of 5 percent by weight after immersion in water for two days at 158 degrees F.

107.6.5 Tensile Strength after Aging. The tensile strength after accelerated aging for five days at 158 degrees F. shall not be less than 80 percent of the original tensile strength.

107.6.6 Compression Set. The compression set after 22 hours at 158 degrees F. shall not be more than 30 percent.

107.6.7 Specific Gravity. The specific gravity shall be 1.20 plus or minus .05.

107.7 TESTS

When tests of the material are required, they shall be made in accordance with the references included in the applicable Federal Specifications or ASTM Designations cited in this specification.

CONSTRUCTION MATERIAL SPECIFICATION

109 - CONCRETE PIPE

109.1 SCOPE

This specification covers the quality and testing of reinforced concrete pipe and fittings.

109.2 REINFORCED CONCRETE PIPE

The dimensions of the pipe shall be as specified in the drawings. The pipe shall be manufactured to withstand the internal and external loading as specified on the drawings. No elliptical reinforcing shall be permitted.

Reinforced concrete pipe shall consist of the following types and classes:

109.2.1 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe. Reinforced concrete culvert, storm drain, and sewer pipe shall conform to the requirements of ASTM Designation C-76 for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, and shall be of five classes identified as Class I, Class II, Class III, Class IV and Class V.

109.2.2 Reinforced Concrete Water Pipe. Reinforced concrete water pipe shall conform to the requirements of Standard Specification AWWA-C300 for Reinforced Concrete Water Pipe-Steel Cylinder Type-Not Prestressed, or AWWA-C301 for Reinforced Concrete Water Pipe-Steel Cylinder Type-Prestressed, or AWWA-C302 for Reinforced Concrete Water Pipe-Non-Cylinder Type-Not Prestressed designed with a steel ring bell and spigot joint with round continuous rubber gasket.

109.3 TESTS

All concrete pipe and fittings shall be subject to testing in accordance with the provisions of the ASTM Designations cited in this specification.

CONSTRUCTION MATERIAL SPECIFICATION

110 - CORRUGATED METAL PIPE AND FITTINGS

110.1 SCOPE

This specification covers the quality and testing of circular, elliptical and arched corrugated metal pipe, with either annular or spiral corrugations, fittings and appurtenances.

110.2 BASE MATERIALS

Corrugated metal pipe, coupling bands, diaphragms, baffle walls and pipe fittings shall be fabricated from corrugated galvanized sheets, the base metal of which shall be made by the open hearth process, or a process that produces genuine wrought iron.

The base metal in respect to chemical constituents shall conform to one of the following alternatives, and unless otherwise shown on the drawings, the Contractor shall have the option of installing any one of the six:

CHEMICAL COMPOSITION BY LADLE ANALYSIS IN PERCENT

KIND OF BASE METAL

Elements	Pure Iron	Copper-Bearing Pure Iron	Copper Iron	Copper Molybdenum Iron	Copper Steel	Genuine Wrought Iron	Tolerance by Check Analysis of Finished Sheets
Carbon, Max.	--	--	--	--	--	.05	--
Manganese, Max.	--	--	--	--	--	.06	--
Phosphorus, Max.	.015	.015	.015	.015	--	.12	--
Sulphur, Max.	.040	.040	.040	.040	.050	.04	.010
Silicon, Max.	--	--	--	--	--	.15	--
Copper, Min.	--	.20	.20	.40	.20	--	.02
Molybdenum, Min.	--	--	--	.05	--	--	--
Sum of first 5 Elements, Max.	--	.10	.25	.25	.70	.42	.04
Sum of first 6 Elements, Max.	.10	--	--	--	--	--	.04

Metal sheets before galvanizing shall be smooth and free from blisters, seams and pits.

110.3 IDENTIFICATION

All metal pipe shall be identified by a stamp on each pipe showing:

First - name of sheet manufacturer
Second - name of brand and kind of base metal
Third - gage number
Fourth - weight of zinc coating
Fifth - identification symbols showing heat number and pot number.

The identification stamps shall be placed on the sheets by the manufacturers of the sheets in such a way that when rolled into pipe such identification shall appear on the outside of each pipe. The right is reserved to inspect the pipe either at the place of manufacture or after its arrival at destination.

The kind of base metal shall be designated independently of the brand or trademark so as to identify clearly the base metal furnished with one of the alternatives shown. The designation of the alternatives may be accomplished by placing on the sheets the initial letters of the exact name of the base metal given in the table, as follows:

PI	for pure iron
CBPI	for copper-bearing pure iron
CI	for copper iron
CMI	for copper molybdenum iron
CS	for copper steel, - and -
GWI	for genuine wrought iron

110.4 CORRUGATIONS

(a) Pipe with annular corrugations shall have corrugations with a pitch of 2-2/3 inches and a depth of 1/2 inch. The allowable tolerance on the pitch and depth shall be 1/8 inch.

(b) Pipe with spiral (helical) corrugations shall have corrugations with a pitch of 1-1/2 to 1-3/4 inches inclusive measured at right angles to the corrugations and a depth of 1/4 inch. The allowable tolerance for pitch and depth shall be 1/8 inch and 1/16 inch, respectively.

110.5 RIVETS

Rivets shall be galvanized and of the same material as the base metal specified for the corrugated sheets.

110.6 RIVETED SEAMS

Rivets shall be not less than 5/16 inch in diameter for sheets weighing 3.28 pounds per square foot (14 gage) and lighter, and not less than 3/8 inch in diameter for sheets weighing over 3.28 pounds and shall be driven cold in such a manner that the sheets will be drawn tightly together throughout the entire lap. The distance between the center of any rivet and the edge of the sheet shall in no case be less than twice the diameter of the rivet. All rivets shall have neat, workmanlike and full hemispherical heads, shall be driven without bending, and shall completely fill the holes. Longitudinal seams for pipe less than 42 inches in diameter shall be riveted with one rivet in the valley of each full corrugation unless indicated otherwise on the drawings. The longitudinal seams of all pipes 42 inches or more in diameter shall be double-riveted. Circumferential seams shall have a maximum rivet spacing of 6 inches. The minimum width of longitudinal seam lap shall be as follows:

Nominal Diameter (Inches)	Minimum Width of Lap (Inches)
6 to 21 inclusive	1-1/2
24 to 36 inclusive	2
Over 36	3

110.7 WELDED SEAMS

The seams shall be continuously welded so that the welds shall be as strong as the base metal. All welding shall be done before galvanizing except where special connections make it impractical to do so. Welds made after galvanizing shall be thoroughly cleaned and then painted with one or more coats of zinc dust-zinc oxide primer conforming to Federal Specification TT-P-641, covering both the weld and the adjacent exposed metal where the galvanizing has been removed by the welding process.

110.8 FOLDED SEAMS

Seams shall be so constructed as not to form an element of weakness.

110.9 WATER-TIGHT PIPE

When called for on the drawings, water-tight pipe shall have all seams close-riveted with a maximum rivet spacing of three (3) inches and shall be capable of satisfactorily containing water under pressure.

110.10 ASBESTOS-BONDED

The inside and outside of the corrugated metal pipe, diaphragms, tees, elbows, baffle walls, and coupling bands when shown on the drawings shall be coated with a layer of asbestos fibers, applied while the metal is in a sheet form, by pressing into a molten metallic bonding medium. Immediately after the metalic bond has been solidified, the asbestos fibers shall be thoroughly saturated with a bituminous saturant. The finished sheets shall be of first-class commercial quality free from blisters and unsaturated spots.

110.11 BITUMINOUS COATING

110.11.1 General. When shown on the drawings, the inside and outside of the corrugated metal pipe, coupling bands and both sides of the diaphragms and baffle wall shall be completely coated with asphalt-cement to a minimum thickness of 0.05 inch measured at the crest of the corrugations. Immediately prior to the application of the bituminous coating, the corrugated metal pipe shall be cleaned of all dirt, mill scale, grease, or loose rust and shall be dry. The outside of the pipe shall be suitably marked at the correct place at both ends to clearly designate the centerline of the top of the pipe.

110.11.2 Bituminous Coating Material. All tests on bituminous material shall be made on samples secured from the material actually being used to coat the pipe. The material shall be not less than ninety-nine and one-half (99.5) percent soluble in carbon bisulfide as determined by ASTM D4. It shall have a loss not greater than one (1) percent when heated to a temperature of 163 degrees C. determined in accordance with ASTM D6. The penetration of residue after heating compared with penetration of the same sample before testing for loss on heating shall not be less than eight-five (85) percent as determined by ASTM D5. The bituminous material shall adhere to the metal tenaciously, shall not chip off in handling and shall protect the metal from deterioration. The ability of the bituminous material to remain in place on the pipe without flowing or sagging due to summer temperatures and the imperviousness of the bituminous material shall be tested as follows:

(a) Flow Test. Two test specimens in the form of cylinders each 3/8 inch in diameter and 3/4 inch in length are obtained by pouring the excess molten bitumen into amalgamated brass molds. Place each specimen in a corrugation of the corrugated slide (slide to be on the 45 degree slope) so that the lower end of each specimen will rest exactly along the line scribed 6 inches from the bottom edge of the slide. Place the test apparatus with the specimens in place in an oven maintained at 150 degrees F., plus or minus 2 degrees. After 4 hours, remove from the oven and cool to room temperature. Measure the distance from the bottom of the currugated plate to the lower edge of the test specimens. This distance subtracted from 6 inches determines the amount of sag or flow. To be acceptable, the flow must not exceed 1/4 inch for either of the two specimens.

(b) Imperviousness Test. A representative sample of coated pipe shall be tested with a twenty-five (25) percent solution of sulphuric acid, a twenty-five (25) percent solution of sodium hydroxide, or a saturated solution of sodium chloride placed in the valley of a corrugation and allowed to remain for a period of forty-eight (48) hours. At the end of this period the bituminous material shall not have loosened or separated from the metal.

110.11.3 Paved Invert. When called for on the drawings, paved inverts on the pipe shall consist of an additional layer of bituminous material applied to form a smooth lining covering twenty-five (25) percent of the internal circumference of circular pipe and forty (40) percent of the internal surface of pipe arches. The lining shall fill the corrugations and have a minimum thickness of one-eighth (1/8) inch above the crest of the corrugations.

110.12 PERFORATIONS FOR DRAINAGE

Perforations, when specified or shown on the drawings, shall be arranged in two groups of longitudinal rows placed symmetrically on either side of an unperforated segment corresponding to the flow line of the pipe. Within each group, the rows of perforations shall be spaced transversely 1 to 1-1/2 inches center to center and in each row the perforations shall be located in the inside crests of all corrugations, except that perforations are not required within 4 inches of each end of each length of pipe or in the crests of corrugations where seams are located.
The perforations shall have a diameter of not less than 1/4 inch and not more than 7/16 inch. The minimum number of longitudinal rows of perforations and the minimum width of the unperforated segment shall be as hereinafter specified. The centerlines of the top or outer rows of holes shall be not more than 80 degrees from the centerline of the unperforated segment.

Nominal diameter of pipe (inches)	Minimum number of longitudinal rows of perforations	Minimum width of unperforated segment measured along the circumference of the pipe (Inches)
6	4	4-1/2
8	4	7
10	4	9
12	6	9-1/2
15	6	13
18	6	16-1/2
21	6	20

110.13 STANDARD FIELD COUPLING BANDS

Field coupling of pipe sections shall be accomplished by means of coupling bands, unless otherwise specified. The band couplers shall be at least five (5) corrugations wide for annular corrugated pipe or seven (7) inches for spiral corrugated pipe. The strength of the band couplers shall be sufficient to securely bind the pipe sections together. The minimum gage for band couplers shall be as indicated in the following tabulation unless otherwise specified:

Diameter in Inches	Gage No.
6 to 25 inclusive	16
30 to 54 inclusive	14
60 to 78 inclusive	12
84 to 96 inclusive	10

The bands shall be so constructed as to lap on an equal portion of each of the culvert sections to be connected, and preferably shall be connected at the ends by galvanized angles having minimum dimensions of two (2) inches by two (2) inches by 3/16 inch. Bands for annular corrugated pipe shall have at least three (3) galvanized bolts not less than 1/2 inch in diameter. Bands for spiral corrugated pipe shall have at least two (2) galvanized bolts not less than 3/8 inch in diameter. Other equally effective methods of connecting the coupling bands may be used with prior approval.

110.14 WATER-TIGHT COUPLING BANDS

The coupling bands shall be made with sixteen (16) gage galvanized steel of at least equal quality to the base metal in the pipe. On pipes smaller than 18 inch diameter a gasket of synthetic sponge rubber shall be placed between the band and the pipe, and the band shall be coated on the outside only with bituminous material applied during or after assembly of the pipe. Bands shall be a minimum of six and three-eights (6-3/8) inches wide and shall be constructed to firmly mesh with and seat in the end corrugations of each of the pipe sections to be joined.

On pipes eighteen (18) inches in diameter and larger coupling bands shall be coated with bituminous material on both sides and held securely in place with rods and tank lugs which conform to the curvature of the pipe. The rods and nuts shall be galvanized. The tank lugs shall be of cast iron conforming to Federal Specification CC-I-652 for Iron, Gray; Castings and shall be galvanized. The coupling bands shall have a minimum width of five (5) corrugations for pipe from eighteen (18) to forty-eight (48) inch diameter and a minimum width of nine (9) corrugations for pipe greater than forty-eight (48) inch diameter. The band shall lap an equal portion of each section of jointed pipe and shall have a minimum circumferential lap of six (6) inches. The coupling bands shall be held in position by at least four (4) rods and tank lugs. The rivets in that portion of the longitudinal seams to be covered by the coupling bands shall be omitted and the seam joined by a continuous weld on the inside and outside of the pipe.

110.15 BAFFLE WALLS (DIAPHRAGMS)

The baffle wall shall consist of corrugated metal sheets and structural steel shapes as indicated on the drawings.

110.16 END REINFORCEMENT

The inlet and outlet ends of pipes constructed of material lighter than No. 10 gage that are to be installed without headwalls, shall be reinforced by either a roll end or a band end.

Other approved methods of end reinforcement may be used, such as light angles or channels, formed to a circle and riveted to the pipe, or a single or double thickness of metal in the rolled end.

110.17 SPECIAL PIPE

Unless otherwise specified all corrugated metal pipe used or furnished under the contract shall be plain galvanized corrugated metal pipe manufactured as herein specified. Where specially manufactured pipes are to be used, specific mention thereto will be made in the Special Specifications or on the drawings.

110.18 INSPECTION

The completed pipe must show first-class, careful workmanship throughout; and any pipe in which defective workmanship is apparent in any respect will be rejected. The following listed defects in particular are specified as constituting poor workmanship, and the presence of any such defects in any pipe will be sufficient cause for its rejection.

a. Uneven laps
b. Elliptical shaping
c. Variation from a straight centerline
d. Ragged or diagonally sheared edges
e. Loose, unevenly lined or spaced rivets
f. Poorly formed rivet heads
g. Unfinished ends
h. Illegible brand
i. Lack of rigidity
j. Bruised, scaled or broken zinc coating
k. Dents or bends in the metal itself other than corrugations

Each individual pipe shall fully concorm with the requirements of this specification and if 20 percent of those in any lot or shipment fails to conform, the entire lot or shipment may be rejected.

110.19 CERTIFIED TESTS

Certified tests for chemical analysis and weight of spelter coating for any of the materials furnished by the Contractor may be required. Unless otherwise specified, chemical analysis shall be in accordance with the Standard Method of Test ASTM E30 and the weight of spelter coating shall be determined in accordance with Standard Method of Test ASTM A90.

CONSTRUCTION MATERIAL SPECIFICATION

WROUGHT IRON, STEEL, COPPER AND CAST IRON PIPE AND FITTINGS

112.1 SCOPE

This specification covers the requirements of wrought iron pipe, steel pipe, steel flanges and fittings and malleable iron pipe fittings, copper pipe and fittings, and cast iron pipe and fittings.

112.2 WROUGHT IRON PIPE

Wrought iron pipe shall meet the requirements of ASTM Designation A72, for Welded Wrought Iron Pipe.

112.3 STEEL PIPE

Steel pipe shall meet the requirements of ASTM Designation A120 for Black or Hot-Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses.

112.4 STEEL PIPE FLANGES AND FITTINGS

Steel pipe flanges and fittings shall meet the requirements of ASTM Designation A181 for Forged or Rolled Steel Pipe Flanges, Forged Fittings and Valves and Parts for General Use.

112.5 MALLEABLE IRON PIPE FITTINGS

Malleable iron pipe fittings shall meet the requirements of Federal Specification WW-P-521b for Pipe Fittings; Malleable Iron (Screwed) 150 Pounds.

112.6 CAST IRON PIPE AND FITTINGS

Cast iron pipe shall be centrifugally cast according to American Standards Association Specification A-21.6 or 21.8 with metal designation 18-40. It shall have a minimum wall thickness and operating pressure as shown on the drawings. Joints and connections shall be as indicated on the plans.

The pipe shall be completely coated inside and outside by immersion in a coal-tar pitch varnish.

Other appurtenances shall conform to the dimensions indicated on the drawings.

112.7 COPPER PIPE AND FITTINGS

Copper tubing shall conform to the requirements of ASTM Designation B88-55 for Seamless Copper Water Tube. The fittings and fixtures shall be cast or wrought bronze or wrought copper of the solder-joint or flared-tube type as shown on the drawings. Bronze fittings and fixtures shall contain not less than eighty-five (85) percent copper and shall conform to the applicable requirements of Federal Specification WW-P-460 for Pipe - Fittings; Bronze (Screwed) 125 and 250 Pound.

All pipe and fittings shall be subject to the tests cited and references noted in the applicable Federal Specifications and ASTM Designations.

CONSTRUCTION MATERIAL SPECIFICATION

STRUCTURAL METAL

117.1 SCOPE

This specification covers structural shapes, eye-bars, castings, rods, with necessary nuts and washers, metal shoes, and plates, but shall not include hardware.

117.2 STRUCTURAL STEEL

Structural shapes, rods, and plates shall be of structural steel conforming to the Standard Specifications for Steel for Bridges and Buildings, ASTM Designation A-7 unless otherwise specified.

117.3 CASTINGS

Steel castings shall conform to the Standard Specifications for Mild-to-Medium Strength Carbon-Steel Castings for General Application, ASTM Designation A-27, Grade 63-35, unless otherwise specified, or they shall be cast iron conforming to the Standard Specifications for Gray Iron Castings, ASTM Designation A-48, Class 40, unless otherwise specified.

CONSTRUCTION MATERIAL SPECIFICATION

GALVANIZING

119.1 SCOPE

This specification covers zinc coatings (galvanized) applied by the hot-dip process on iron and steel products.

119.2 ZINC FOR COATING

The zinc used for coating shall be the grade of zinc designated in the ASTM specification for the iron or steel product to be coated, and shall meet the requirements of ASTM Designation B-6 for Slab Zinc (Spelter).

119.3 WEIGHT OF ZINC COATING

The weight of zinc coating per square foot of actual surface shall be in accordance with the ASTM specifications for the iron or steel product coated.

119.4 SPECIFICATION FOR GALVANIZING (ZINC COATING)

Materials shall be hot-dipped galvanized in accordance with the latest revision of the appropriate ASTM Specifications listed in the following table:

Material	ASTM Designation
Iron and Steel Hardware, Screws, Bolts, Nuts, Washers, Anchor Bolts, Grey Iron and Malleable Iron Castings, Steel Castings	A-153
Corrugated Metal Pipe, Steel or Iron Sheets	A-93 Classic C Coating
Structural Steel Shapes, Tie Rods, Ornamental Iron Railings, Handrails	A-123
Steel and Iron Pipe	A-120
Iron and Steel Wire and Farm-Field Wire Fencing	A-116 Class 2 Coating
Chain Link Fence Fabric, Galvanized after Weaving	A-392
Chain Link Fence Fabric, Galvanized before Weaving	A-392 Class A-A Coating
Barbed Wire	A-121 Class 2 Coating
Steel Wire Strand, Galvanized and Extra Galvanized	A-122 Class A Coating

119.5 TESTS

When required, tests for uniformity of coating, weight of coating and detection of embrittlement shall be made in accordance with the following ASTM Specifications:

Uniformity of coating - Preece test	A-239
Standard Method of Test for Weight of Coating	A-90
Procedure for detecting embrittlement of hot-galvanized structural steel products	A-143

119.6 WORKMANSHIP

The zinc coating (galvanizing) shall be applied in such a manner that the zinc coating will not peel off. The coating shall be free from blisters, smooth and uniform throughout. Cutting, punching, bending, welding, drilling, thread cutting and other fabricating shall, if possible, be done before galvanizing. All members, nuts, bolts and washers shall be galvanized before a structural unit is assembled.

CONSTRUCTION MATERIAL SPECIFICATION

BITUMINOUS-FIBRE PIPE

120.1 SCOPE

This specification covers the quality and testing of both perforated and non-perforated bituminous fibre pipe and fittings.

120.2 PIPE

The pipe and fittings shall conform to the National Bureau of Standards, Commercial Standard Specification CS-116.

120.3 PERFORATIONS

The size and spacing of holes shall be in accordance with the pipe manufacturer's recommendations or as shown on the drawings.

120.4 TESTS

The pipe and fittings shall be subject to the tests cited and references noted in the Commercial Standard Specification CS-116.

121 - VEGETATION MATERIALS

121.1 SCOPE

This specification covers the requirements for fertilizer, lime, seed, and mulch and associated materials.

121.2 FERTILIZER

Fertilizer shall be a complete commercial fertilizer of 10-5-5 grade, or approximate equivalent as approved by the Engineer. Forty (40) percent or more of the nitrogen in the fertilizer shall be in organic form.

121.3 LIME

Lime shall be ground limestone containing not less than thirty-five (35) percent calcium oxide, and not less than five (5) percent magnesium oxide; and particle size shall be in conformance with the 1960 Definition C-6 of the Association of American Fertilizer Control Officials for "Pulverized" limestone.

121.4 SEED

Seed shall be fresh, recleaned seed of the latest crop and shall meet the minimum standards for tolerance for P.L.S. (Purity x Germination) contained in the current Federal Seed Act.

121.5 MULCH

Mulch shall be bright, clean cereal (oat, wheat, rye) grain straw.

121.6 PAPER TWINE FABRIC

Paper twine fabric shall be Bemis Mulchnet, or equivalent.

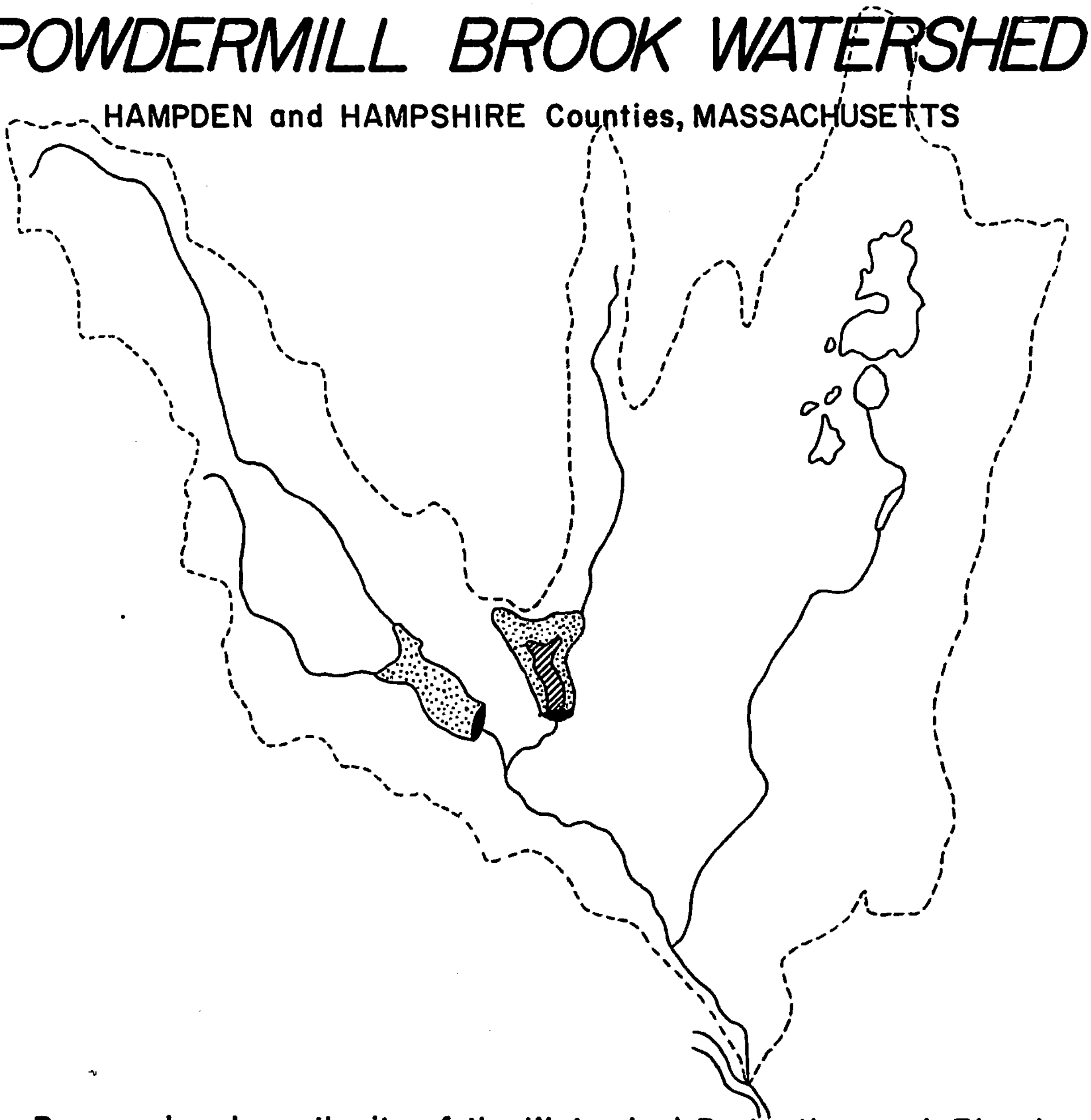
121.7 JUTE NETTING

Jute netting shall be Ludlow "Soil Saver", No. 48, or equivalent.

WATERSHED WORK PLAN
FOR
WATERSHED PROTECTION AND FLOOD PREVENTION

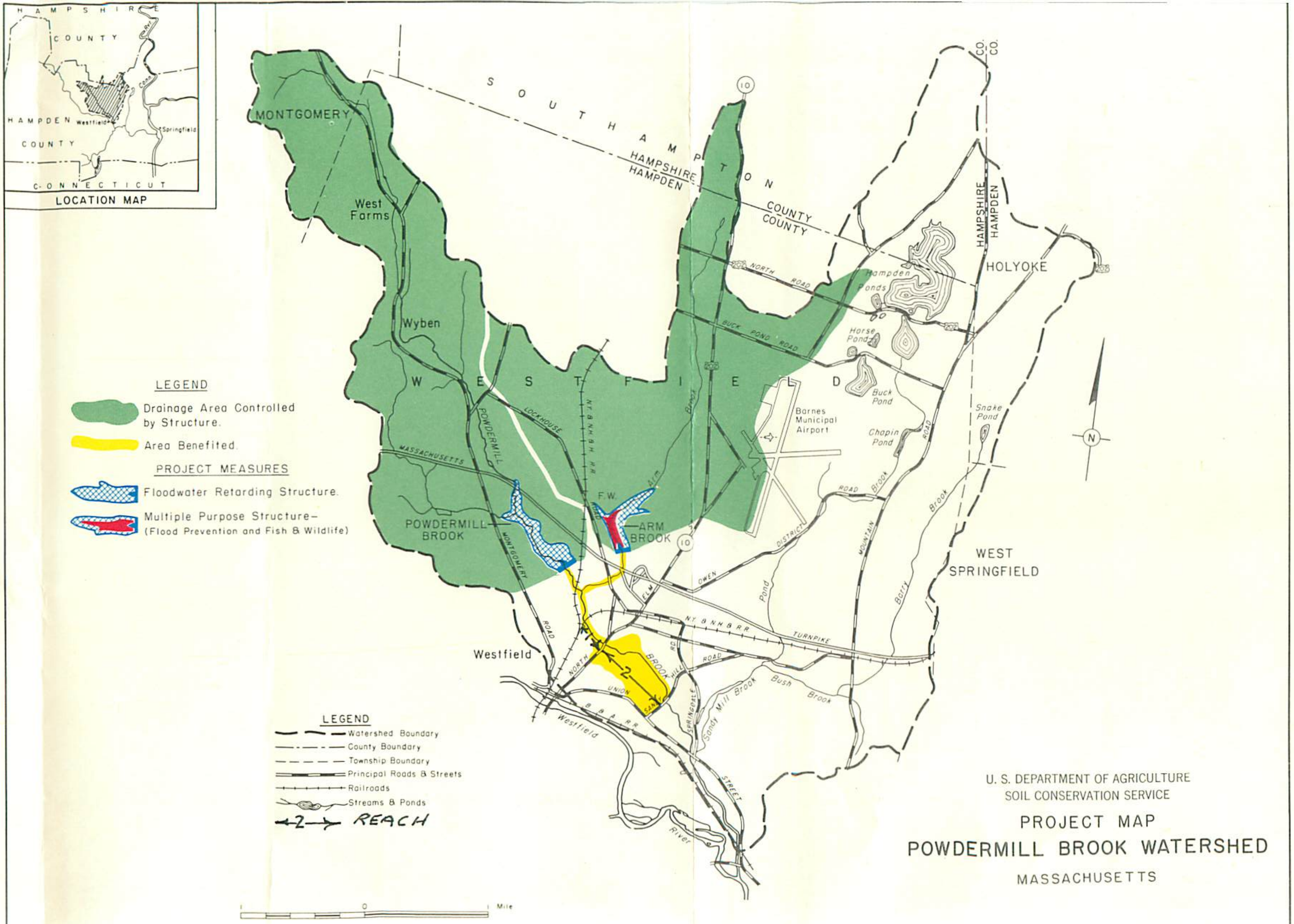
POWDERMILL BROOK WATERSHED

HAMPDEN and HAMPSHIRE Counties, MASSACHUSETTS



Prepared under authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666) as amended

August 1961



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PROJECT MAP
POWDERMILL BROOK WATERSHED
MASSACHUSETTS

WATERSHED WORK PLAN
FOR
WATERSHED PROTECTION AND FLOOD PREVENTION

POWDERMILL BROOK WATERSHED
Hampden and Hampshire Counties, Massachusetts

Prepared Under the Authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666) as amended.

Prepared by:
Hampden Soil Conservation District
and
City of Westfield

With Assistance by:
U. S. Department of Agriculture, Soil Conservation Service
U. S. Department of Agriculture, Forest Service

August 1961

TABLE OF CONTENTS

Page

SECTION 1 - THE WATERSHED WORK PLAN 1

SUMMARY OF PLAN 1
  Land Treatment Measures 2
  Structural Measures 2
  Damages and Benefits 3
  Provisions for Financing Installation of Structures 3
  Operation and Maintenance 3

DESCRIPTION OF THE WATERSHED 4
  Physical Data 4
  Topography 4
  Geology 4
  Soils 4
  Climate 5
  Land Use 5
  Economic Data 6

WATERSHED PROBLEMS 7
  Floodwater Damage 7
  Erosion Damage 7
  Sediment Damage 7
  Problems Relating to Water Management 7

EXISTING AND PROPOSED WORKS OF IMPROVEMENT 9

WORKS OF IMPROVEMENT TO BE INSTALLED 10
  Land Treatment Measures 10
    Cropland and Pasture Practices 10
    Forestry Practices 11
  Structural Measures 12
  Figure 1 - Project Map Follows page 40
  Table 1 - Estimated Installation Cost 13b

BENEFITS FROM WORKS OF IMPROVEMENT 14

COMPARISON OF BENEFITS AND COSTS 15

ACCOMPLISHING THE PLAN 16
  Land Treatment Measures 16
  Structural Measures 17

PROVISIONS FOR OPERATION AND MAINTENANCE 19
  Land Treatment 19
  Structural Measures 19

Page

COST SHARING 20

CONFORMANCE OF PLAN TO FEDERAL LAWS AND REGULATIONS 22

SECTION 2 - INVESTIGATIONS, ANALYSES, SUPPORTING TABLES AND MAPS 23

LAND TREATMENT MEASURES 23

HYDRAULICS AND HYDROLOGY 24
- General 24
- Frequency Data 24
- Evaluation Routings 24
- Key Storm Routings 25
- Rating Curves 25
- Evaluation 26
- Structures 26

ECONOMICS 27
- Damage Appraisals 27
- Evaluation 27
- Cost Allocation 28
- Land, Easements and Rights-of-Way 29

GEOLOGY 30
- Structure Site Investigations 30
- Sediment and Erosion Studies 30

STRUCTURE INVESTIGATION 31
- Floodwater Retarding and Multiple Purpose Structures 31
  - Principal Spillways 31
  - Emergency Spillways 31
  - Field Surveys 31

Page

TABLES

Table 2 - Estimated Structure Cost Distribution 32
Table 3 - Structure Data - Floodwater Retarding Structures 33
Table 4 - Summary of Physical Data 34
Table 5 - Summary of Plan Data 35
Table 6 - Annual Costs 36
Table 7 - Monetary Benefits from Structural Measures 37
Table 8 - Benefit-Cost Analysis 38
Table 9 - Allocation of Installation Costs of Structural Measures 39
Table 10 - Benefits from Works of Improvement by Reaches 40

SECTION 1

WATERSHED WORK PLAN

POWDERMILL BROOK WATERSHED

Massachusetts

SUMMARY OF PLAN

The Powdermill Brook Watershed drains 12,825 acres, of which 11,900 acres are in Hampden County and 925 acres in Hampshire County. All of the floodwater damages and all works of improvement included in this work plan are located in Hampden County.

The sponsoring local organizations are the Hampden Soil Conservation District and the City of Westfield.

This plan was developed jointly by the Soil Conservation Service, the U. S. Forest Service, the Hampden Soil Conservation District, and the City of Westfield. Other state and Federal agencies contributing to the plan were: Massachusetts Water Resources Commission, Massachusetts Division of Fisheries and Game, the U. S. Fish and Wildlife Service, and the U. S. Army Corps of Engineers.

Records indicate that floods causing serious damage occur about once in 12 years. Some damage to agricultural land in the flood plain is experienced more frequently. The largest flood of record occurred August 18-19, 1955. In this storm 19.8 inches of rainfall fell on the watershed in 34 hours. Runoff resulting from this storm caused direct floodwater damages of $820,150.

The plan includes conservation land treatment measures for watershed protection, one floodwater retarding structure, and one multiple purpose floodwater retarding-fish and wildlife enhancement structure.

The works of improvement are to be installed in a five-year period at a total estimated installation cost of $470,176. The share of this cost to be borne by Public Law 566 funds is $282,073. The balance of $188,103 will be borne by other funds.

Land Treatment Measures

The cost of land treatment is estimated at $153,214, of which $138,214 will be borne by other funds. Public Law 566 funds in the amount of $15,000 will be used entirely for accelerated technical assistance. This sum consists of $8,700 for use of the U. S. Forest Service, and $6,300 for use of the Soil Conservation Service.

Structural Measures

A floodwater retarding structure will be built on the Powdermill Brook. The Arm Brook structure is a multiple purpose floodwater retarding-fish and wildlife enhancement structure. These two structures control runoff from a total of 5,076 acres of the watershed. They provide for 1,547 acre-feet of floodwater storage, 142 acre-feet of permanent storage for fish and wildlife enhancement, and 23 acre-feet of sediment storage.

The total estimated installation cost of these two structures is $316,962, of which $284,917 is allocated to flood prevention and $32,045 to fish and wildlife enhancement. Of the total installation cost Public Law 566 funds will bear $267,073. The local share of installation costs will be $49,889. The following table shows how the installation costs are prorated:

Installation Item	P. L. 566 Funds		Other Funds		Total
	Flood Prevention	Fish & Wildlife Enhancement	Flood Prevention	Fish & Wildlife Enhancement	
Construction	186,273	8,645	--	12,354	207,272
Installation Services	64,778	7,377	--	--	72,155
Administering Contracts	--	--	1,863	210	2,073
Land, Easements & Rights-of-Way	--	--	32,003	3,459	35,462
Totals	251,051	16,022	33,866	16,023	316,962

The Massachusetts Division of Fisheries and Game will provide materials and personnel to practice fish and wildlife management at the Arm Brook site. Provisions for public access to this site will be included in the acquisition of land, easements and rights-of-way.

Damages and Benefits

The estimated average annual floodwater damage in the watershed from Powdermill Brook under present conditions is $19,156. The future average annual damages with the project installed is estimated to be $175.

The average annual flood prevention benefit from land treatment measures is $1,399 and from structural measures is $17,582. The estimated average annual flood prevention cost of these structures is $11,360. This results in a benefit-cost ratio of 1.5 to 1. In addition, public benefits will be derived from the use of the fish and wildlife enhancement pool. These latter benefits were not evaluated monetarily.

Provisions for Financing Installation of Structures

The City of Westfield will be responsible for obtaining all necessary land, easements and rights-of-way. This cost is estimated at $35,462. The city will also pay the local construction cost allocated to fish and wildlife enhancement in the Arm Brook structure estimated at $12,354.

The City of Westfield will be responsible for administering the contracts for installation of structural measures.

Construction costs for flood prevention ($186,273) and the Federal share for fish and wildlife enhancement ($8,645) will be paid from Public Law 566 funds. Public Law 566 funds will also bear the cost of installation services ($72,155).

Operation and Maintenance

Land treatment measures will be installed, operated, and maintained by local landowners and operators under agreements with the Hampden Soil Conservation District.

The City of Westfield will be responsible for operation and maintenance of the structural measures. This cost is estimated at $1,200 annually. Funds for this will be provided through appropriations by the city.

DESCRIPTION OF THE WATERSHED

Physical Data

The Powdermill Brook Watershed has a drainage area of 12,825 acres (20.04 square miles) all within the Commonwealth of Massachusetts. The major portion of the watershed lies in Hampden County with only 925 acres in Hampshire County. The area includes parts of the Cities of Westfield, Holyoke, and West Springfield and the Town of Montgomery in Hampden County, and the Town of Southampton in Hampshire County.

Powdermill Brook originates in the Town of Montgomery and flows southeasterly approximately eight and five-tenths (8.5) miles through the City of Westfield to its confluence with the Westfield River. Major tributaries are Arm Brook and Sandy Mill Brook.

Topography

The Powdermill Brook Watershed lies within the Central Connecticut Valley between the eastern and western highlands. This area has been over-ridden by glaciers. Upland swamps, ponds, drumlins and terraces are very common throughout. Topographic extremes are found, varying from gentle terrain in the lower portion to steep sided V-shaped valleys in the upper reaches of Powdermill Brook. The maximum elevation in the headwaters is 940 feet and the minimum elevation is 120 feet.

Geology

The watershed is covered by a mantle of unconsolidated Pleistocene glacial deposits underlain by Triassic sandstones. Glacial till has been deposited in the form of drumlins and moraines. It varies from a few feet to several hundred feet in thickness and consists of silt, sand, gravel and boulders. Stratified deposits include both fine lacustrine deposits and coarse outwash materials. Some of these are covered by a mantle of water deposited sands and gravels. Glacial till probably underlies many of the stratified deposits.

Soils

Upland soils occupy about 30% of the watershed. Terrace soils occupy 60% of the watershed. The remainder consists of recent alluvium, mucks, peats, and miscelleanous deposits of wind blown material.

The deep upland soils are derived from loose to very compact till. The principal well-drained series are Cheshire, Paxton, and Charlton. The shallow to bed rock soils belong to the Hollis and Sunderland series. Textures of these soils vary from loam to sandy loam.

The terrace soils are derived from stratified glaciofluvial deposits. The principal series are Merrimac, Agawam, and Hartford. Fine sandy loam and sandy loam are the predominant surface textures with sand and gravel subsoils. Large deposits of peat are to be found.

The principal soils in the flood plain are the Podunk and Rumney series and are frequently flooded. Surface textures of these soils are predominantly silt loams and very fine sandy loams. The drainage of these soils and their associated series ranges from moderately well drained to poorly drained. Deposits of peat and muck occur in this flood plain.

Climate

Average annual precipitation on the watershed is 47 inches. It is generally uniformly distributed throughout the year. Most of the precipitation during the winter season is in the form of snow.

Annual runoff from the watershed averages 23 inches. Spring runoff causes some annual flooding but major flooding is usually associated with storms of tropical origin.

The average growing season is from April 30 to October 13, 166 days.

Land Use

The major uses of land within the watershed are:

1. Woodland	8,055 acres	- sixty-three percent
2. Cropland	1,635 acres	- thirteen percent
3. Grassland	1,155 acres	- nine percent
4. Urban	874 acres	- seven percent
5. Water	260 acres	- two percent
6. Other	846 acres	- six percent

Second-growth hardwoods, mostly northern hardwoods and mixed oak types, occupy 62 percent of the forest area; white pine, pitch pine, and hemlock, 15 percent; and the remaining 23 percent mixed stands.

Economic Data

Approximately 12,000 people reside within the watershed. Population projections, as furnished by the Massachusetts Department of Commerce, predict that by the year 2000 there will be an increase of 61 percent.

There are approximately 325 acres in the flood plain of the Powdermill Brook and its tributaries. This represents two and one-half percent of the total watershed area. The flood plain land is used principally for agricultural, industrial and residential purposes.

There are 110 farms within the watershed averaging 65 acres and having an average value of $26,315. Major crops grown are vegetables, dairy products, tobacco, and fruit.

There is no Federal land within the watershed. Farmers own about 4,500 acres of forest land. The rest of the forest land is devoted to resort areas and summer homes or held as an investment.

Past use of forest land is responsible for present stand-size and condition. Although largely immature, these stands have a potential for hydrologic improvement and for the production of timber crops. Sawtimber (1,500 board feet or more per acre) occupies 35 percent of the forest land, poletimber (200 cubic feet or more per acre) 61 percent, and the remaining 4 percent of the forest land is seedlings and saplings.

Given protection, care and management the forest stands are expected to contribute substantially to the future over-all economy of the watershed.

Industry within the area consists of the manufacture of machine needles, surgical needles, decorated metal products, name plates, dials, and radiators for commercial and industrial use. These industries have an estimated annual payroll in excess of $2,500,000.

Transportation facilities are excellent. The New York, New Haven and Hartford, and the New York Central Railroads service the area. The major highways are Route 10, Route U. S. 202, and the Massachusetts Turnpike.

Utilities servicing the area include electric power, natural gas and oil.

WATERSHED PROBLEMS

Floodwater Damages

Damages in excess of $820,000 occurred within the Powdermill Brook Watershed, as the result of the hurricane "Diane", August 18-19, 1955. This storm caused major damages to 77 homes housing 460 people, 10 industrial and commercial establishments employing 625 people, 3 farms producing high value crops, a mile of paved highway, a bridge, and 2 railroad culverts. Other storms causing major damage occurred in November 1927, March 1936, September 1938, and December 1948.

Approximately 178 acres of bottomland is subject to flooding. Fifty acres are used for intensive production of high value vegetable crops. Celery, scullions, and spinach are the main crops. The remaining acreage is used for residential and industrial purposes.

The area from Sandy Hill Road to the Westfield River is subject to flooding by backwater from the Westfield River. These damages are not attributable to the Powdermill Brook.

Sandy Mill Brook confluences with Powdermill Brook below reach 2 (see map) and does not contribute to damages in reaches 1 and 2.

Indirect damages to agriculture are: (1) loss of perishable products due to disruption of transportation facilities, (2) los of perishable products from failure of refrigeration equipment caused by interruption of electric power.

Non-agricultural indirect damages are: (1) loss of industrial production, (2) loss of orders because of delayed shipment, (3) loss of wages to employees, (4) the high cost of re-routing rail and vehicular traffic.

Erosion Damage

Erosion damage in the watershed consists of streambank cutting, sheet and rill erosion. The magnitude of these damages is not great enough to support land treatment measures for flood prevention.

Sediment Damage

A sediment damage study of the watershed revealed a small amount of damage from swamping, scouring, and infertile overwash. These damages were evaluated as part of the floodwater damages.

Problems Relating to Water Management

The development of additional areas for recreation including fishing, hunting and nature studies is desirable. Existing facilities do not meet the current and future needs.

Agricultural water management problems, such as drainage and irrigation, are local in nature and do not require project action. The needs for drainage and irrigation are being met by individual landowners and operators under other going programs.

EXISTING OR PROPOSED WORKS OF IMPROVEMENT

There are no existing works of improvement in the watershed which provide measurable flood prevention benefits, and no flood protection measures are presently planned for this watershed.

The works of improvement as set forth in this plan will contribute to the comprehensive development of the Westfield River Basin.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

Land treatment measures contained in this plan are for the purpose of watershed protection. These measures contribute to program objectives of reducing runoff and erosion by increasing infiltration rates and water retention capacity of the soil.

Acceleration of the land treatment program now being carried out by the Hampden Soil Conservation District is needed to accomplish these objectives. Land treatment is especially important for protection of these lands to support, supplement, and insure the useful life of the structural measures. The application of the land treatment measures contained in this work plan will promote conservation, development and improvement of agricultural land and water management. These measures provide for using the land within its capabilities and treat it according to its needs.

The following measures are to be installed during a five-year period:

Cropland and Pasture Practices

These land treatment measures have been developed for installation on the farm lands within the watershed. They are based on a survey of conservation needs made by the Hampden Soil Conservation District.

1. Conservation Cropping Systems (500 acres)

   This practice provides for growing crops in combination with needed cultural and management measures. Cropping systems include the use of rotations that contain grasses and legumes. This practice maintains and improves the soil structure thus improving the rate of infiltration and waterholding capacity of the soil.

2. Cover Cropping (80 acres)

   This practice involves the use of close growing crops between periods of regular crop production or during over-winter periods in cultivated orchards.

3. Hayland Planting (200 acres)

   Establishing long term hay stands of grasses and legumes.

4. Pasture Renovation (200 acres)

   The improving of permanent pasture by discing or other mechanical methods to increase vegetative cover.

5. Critical Area Planting (75 acres)

   The stabilizing of silt-producing and severely eroded areas by establishing vegetative cover. This includes woody plants, such as trees, shrubs, or vines and adapted grasses or legumes established by seeding or sodding to provide long term ground cover.

6. Diversions (.5 mile)

   Grading or digging a channel across the slope with a supporting ridge on the down-hill side, to intercept excessive runoff and protect areas below from erosion and overflow.

7. Grassed Waterways (5 acres)

   Reshaping or grading and establishing suitable vegetation of natural waterways or depressions.

8. Grade Stabilization Structures (No. 5)

   Installing a grade stabilizing structure or structures in water courses. Such structures may include drop inlets, chutes, drops or others.

9. Streambank Protection (.2 mile)

   Improving the hydraulic characteristics of streams or excavated channels.

Forestry Practices

The following remedial program has been developed by the local people from a statement of land treatment needs prepared by the Massachusetts Division of Forests and Parks and the U. S. Forest Service. Land treatment needs were determined by a field survey of the watershed.

To insure proper forest land treatment and maximum watershed protectiin the following measures will be installed:

1. Tree Planting (60 acres)

   Artificial reforestation of certain open land is necessary to adjust land use with capability and to reduce runoff and erosion by developing a protective cover and an absorbent forest floor "sponge" of humus and litter. Under such conditions the soil is protected, infiltration rates improved, soil moisture and storage capacity increased, and the land is put to its best use.

2. Hydrologic Cultural Operations (1,235 acres)

   These silvicultural operations are aimed at improving hydrologic conditions by manipulation of stand composition to create conditions favorable to the maximum production and protection of litter, humus, and forest cover. They include thinnings, weedings, improvement, and harvest cuttings.

3. Skid Trail and Logging Road Erosion Control (2 miles)

   The objective of this measure is to divert water from eroding skid trails and logging roads in order to reduce and control soil erosion and sedimentation. Simple water bars (ditches with pole or earthen diversions), spaced at specified intervals, are the usual means applied to slow down and divert water. Some eroding areas need revegetation to hold soil in place.

Estimated installation costs of the land treatment measures are shown in Table 1 of this work plan.

Structural Measures

One floodwater retarding structure and one multiple purpose floodwater retarding-fish and wildlife enhancement structure constitute the structural measures contained in this work plan.

These two structures control the runoff from 5,076 acres. This represents 40 percent of the entire watershed area, and 79 percent of the area contributing to the floodwater damages.

Powdermill Brook Structure

This structure is located on the Powdermill Brook approximately 800 feet upstream from the main line of the New York, New Haven and Hartford Railroad. This dam will be about 47 feet high and contain 100,000 cubic yards of earth fill. It will control 2,894 acres of drainage area and have capacity to store 4.0 inches of runoff or 966 acre-feet. The dam will have a self-regulating principal spillway consisting of a 48 inch reinforced concrete pipe conduit extending through the base of the dam, and a low, vertical, reinforced concrete drop inlet. Appurtenances to the drop inlet will include an anti-vortex device and a trash rack. This dam will not impound water except in times of excess runoff.

Arm Brook Structure

This structure is located on Arm Brook approximately 450 feet north of the Massachusetts Turnpike. This dam will be about 56 feet high and contain 77,200 cubic yards of earth fill. It will control 2,164 acres of drainage area and have capacity to store 3.3 inches of runoff or 581 acre-feet. The dam will have a self-regulating principal spillway consisting of a 42-inch reinforced concrete pipe conduit extending through the base of the dam, and a single-stage, vertical, reinforced concrete drop inlet. Appurtenances to the drop inlet will include an anti-vortex device, trash racks, and gate at the base. The top of the drop inlet will be set at an elevation to provide for sediment storage and a fish and wildlife enhancement pool. The permanent pool will have a surface area of 13 acres and a volume of 150 acre-feet.

Each dam will have, in addition to the principal spillway, a grassed emergency spillway built into one of the abutments. Emergency spillways are provided to pass storms of rare occurrence with safety to the structure. Storage capacity will be added to each structure to provide for the anticipated sediment accumulation over a fifty-year period. No relocation or modification of existing railroads, highways, bridges, homes or utilities is necessary for structure installations.

The total installation cost of these two structures is estimated to be $316,962. These structures will contain 1,547 acre-feet of floodwater detention capacity, 142 acre-feet of stoxage for fish and wildlife enhancement and 23 acre-feet for sediment storage.

TABLE 1 - ESTIMATED INSTALLATION COST
Powdermill Brook Watershed
Massachusetts

Installation Cost Item	No. to be Applied		Estimated Cost (Dollars)		
	Unit	Total Non-Fed. Lands	PL 566 Funds Non-Fed. Lands	Other Funds Non-Fed. Lands	Total
LAND TREATMENT FOR Watershed Protection					
Soil Conservation Service					
Conservation Cropping System	Acre	500		35,000	35,000
Cover Cropping	Acre	80		800	800
Hayland Planting	Acre	200		14,000	14,000
Pasture Renovation	Acre	200		14,000	14,000
Critical Area Planting	Acre	75		18,750	18,750
Diversions	Mile	.5		558	558
Grassed Waterways	Acre	5		1,850	1,850
Grade Stabilization Structures	No.	5		2,000	2,000
Streambank Protection	Mile	.2		2,816	2,816
Technical Assistance			6,300	4,940	11,240
SCS Subtotal			6,300	94,714	101,014
Forest Service					
Tree Planting	Acre	60		3,800	3,800
Hydrologic Culture Operations	Acre	1,235		30,400	30,400
Skid Trail and Logging Road Erosion Control	Mile	2		600	600
Technical Assistance			8,700	8,700	17,400
FS Subtotal			8,700	43,500	52,200
TOTAL LAND TREATMENT			15,000	138,214	153,214
STRUCTURAL MEASURES					
Soil Conservation Service					
Floodwater Retarding Structures	No.	1	100,352		100,352
Multiple Purpose Floodwater Retarding and Fish and Wildlife Enhancement Structures	No.	1	94,566	12,354	106,920
Subtotal - Construction			194,918	12,354	207,272
Installation Services					
Soil Conservation Service					
Engineering Services			52,802		52,802
Other			19,353		19,353
Subtotal - Installation Services			72,155		72,155
Other Costs					
Land, Easements and Rights-of-way				35,462	35,462
Administration of Contracts				2,073	2,073
Subtotal - Other Costs				37,535	37,535
TOTAL STRUCTURAL MEASURES			267,073	49,889	316,962
TOTAL PROJECT			282,073	188,103	470,176
Summary					
Subtotal - SCS			273,373	144,603	417,976
Subtotal - FS			8,700	43,500	52,200
TOTAL PROJECT			282,073	188,103	470,176

Price Base 1961 August 1961

BENEFITS FROM WORKS OF IMPROVEMENT

The works of improvement included in this work plan will provide flood protection to ten industrial and commercial establishments employing approximately 625 people; 77 residences housing about 460 people; 3 farms; one highway bridge; and approximately one mile of streets and highways.

The works of improvement contained in this work plan will give 98.4 percent reduction in damages caused by runoff of 3.98 inches in 6 hours. This is estimated to be a 500-year frequency storm.

The "Diane" storm of August 18-19, 1955, produced runoff greater than that to be expected from a 500-year frequency storm. The works of improvement contained in this work plan would not provide a high level of protection from a reoccurrence of the "Diane" storm.

The combined land treatment and structural program will reduce average annual damages in the watershed from $19,156 to $175 or 99 percent (see Table 10). The direct floodwater damages will be reduced from $16,053 to $151, and the indirect floodwater damages from $3,103 to $24.

The reduction in direct average annual floodwater damages, by type, is as follows:

Agricultural	From	$ 2,147	to	$124	(94.2%)
Retail and Commercial	From	10,999	to	22	(99.8%)
Residential	From	2,711	to	5	(99.8%)
Road, Bridge and Utility	From	195	to	0	(100.0%)

Damages in agricultural reach No. 2 (see map) caused by floods that occur more frequently than once in 20 years will be practically eliminated. The peak flows from Powdermill Brook produced by the less frequent storms will be reduced. However, the extent of reduction was not evaluated because these flood events may coincide with backwater flooding from the Westfield River. It would be difficult to differentiate the damages caused by floods from Powdermill Brook and the backwater from Westfield River. Damages caused by the Westfield River in this reach will not be reduced by the works of improvement included in this work plan.

The fish and wildlife pool in the Arm Brook site would provide a high-quality trout habitat, and support a considerably increased angling opportunity over that provided by the inundated stream segment. Some 342,500 persons live in the watershed area and in the nearby cities of Westfield, Holyoke, West Springfield, Chicopee and Springfield and there is a great demand by fishermen from these areas for a trout fishery of the type that could be produced in the impoundment. It is estimated that about 3,000 man-days of fishing could be provided for area fishermen annually.

COMPARISON OF BENEFITS AND COSTS

The total average annual benefits of the structural works of improvement contained in this plan are $17,582. The average annual cost of these structural measures is $11,360. The benefit-cost ratio of the structural measures is 1.5 to 1. Benefits for fish and wildlife enhancement are not evaluated and, therefore, neither the cost nor benefits for this purpose are included in these figures.

ACCOMPLISHING THE PLAN

Land Treatment Measures

The Hampden Soil Conservation District will assist landowners and operators cooperating with the district in the preparation and application of farm conservation plans. Before construction begins on a structure, fifty percent of the land needing protection in the drainage area above will be under cooperative agreement with the Soil Conservation District.

The Agricultural Extension Service of Massachusetts will assist the Soil Conservation District in developing and carrying out an information and educational program to stimulate interest in watershed activities.

The forest land treatment measures will be installed by the landowners with technical assistance furnished by the Massachusetts Division of Forests and Parks in cooperation with the U. S. Forest Service. Individual management plans will be prepared for at least 70 forest landowners, outlining practical measures to be applied in the immediate future to maintain and improve the hydrologic condition of their forest land. Other technical assistance is needed to assure protection of watershed values and completion of the program. Included are supplemental activities such as developing timber sale or operating contracts, laying out skid trail and logging road systems, stimulation of landowner interest and participation in the program, and general planning and supervision of the program.

The Hampden County Agricultural Stabilization and Conservation Committee through the Agricultural Conservation Program will assist by offering cost-sharing on the land treatment measures and will encourage farmers in the watershed to apply those measures included in the work plan. Funds permitting, the State Agricultural Stabilization and Conservation Committee will allocate additional ACP funds to the County for carrying out cost-sharing practices to further accelerate the installation of these land treatment measures. The actual determination of how much assistance can be provided will be made on an annual basis and will be influenced by the needs and desires of the landowners.

Technical assistance will be provided by the Soil Conservation Service with funds provided by Public Law 566 and other programs. This assistance will be provided for the installation of land treatment measures for watershed protection, including assistance needed for the development of basic conservation plans on farms in the watershed.

The land treatment measures are to be installed over a five-year period.

Structural Measures

The Soil Conservation Service will provide the installation services to design, layout and supervise construction. The Service will pay construction costs allocated to flood prevention, and P. L. 566 share of the cost of construction allocated to fish and wildlife enhancement.

The City of Westfield will be responsible for administering the contracts for installation of structural measures.

The City of Westfield will obtain, at no cost to the Federal government, all land, easements and rights-of-way necessary for installation of the structural measures. The city will pay the allocated non-Federal share of construction costs for fish and wildlife enhancement. Provisions for public access to the Arm Brook site will be included in the acquisition of land, easements and rights-of-way. No special tax levy will be made for these purposes.

The Massachusetts Division of Fisheries and Game will provide material and personnel to practice fish and game management measures in the Arm Brook site.

The sponsoring local organizations do not intend to obtain a Farmers Home Administration loan.

Federal assistance for carrying out the works of improvement described in this plan will be provided under the authority of the Watershed Protection and Flood Prevention Act, Public Law 566 (83rd Congress, 68 Stat. 666) as amended.

The structural works of improvement will be installed in one year.

The schedule for installation of land treatment and structural works of improvement is as follows:

Year		Structural Measures	Land Treatment	Total
First	- P. L. 566 funds	267,073	3,000	270,073
	Other funds	49,889	27,642	77,531
	Yearly Total	316,962	30,642	347,604
Second	- P. L. 566 funds	--	3,000	3,000
	Other funds	--	27,643	27,643
	Yearly Total	--	30,643	30,643
Third	- P. L. 566 funds	--	3,000	3,000
	Other funds	--	27,643	27,643
	Yearly Total	--	30,643	30,643
Fourth	- P. L. 566 funds	--	3,000	3,000
	Other funds	--	27,643	27,643
	Yearly Total	--	30,643	30,643
Fifth	- P. L. 566 funds	--	3,000	3,000
	Other funds	--	27,643	27,643
	Yearly Total	--	30,643	30,643
Project Period Totals				
	P. L. 566 funds	267,073	15,000	282,073
	Other funds	49,889	138,214	188,103
	Grand Total	$316,962	$153,214	$470,176

PROVISIONS FOR OPERATION AND MAINTENANCE

Land Treatment

Land treatment measures will be maintained by the landowners or operators of the lands in cooperation with the Hampden Soil Conservation District. Technical assistance and guidance will be provided by the Soil Conservation Service and by the Massachusetts Division of Forests and Parks in cooperation with the U. S. Forest Service.

Structural Measures

The City of Westfield will be responsible for operation and maintenance of the floodwater retarding structure on Powdermill Brook and the multiple purpose floodwater retarding-fish and wildlife enhancement structure on Arm Brook. Necessary funds will be provided through appropriations by the city.

An operation and maintenance agreement will be executed between the City of Westfield and the Federal government prior to issuing the invitations to bid for the construction of the structures.

Inspections of the structural works of improvement will be made annually and after major storms as provided for in the operation and maintenance agreement. The Soil Conservation Service will provide at least one technical representative to accompany those making these inspections.

The annual cost of operating and maintaining the two structures is estimated to be $1,200 and will consist of but not be limited to, the following:

1. Remove and burn debris.
2. Refill, smooth and vegetate rilling on embankments, spillways and drainage ways.
3. Realign disposal channel.
4. Repair damaged riprap or other works.
5. Repair fences and gates.
6. Maintain a good soil cover.

The City of Westfield will keep records of maintenance work performed and costs therof, and report them annually to the Soil Conservation Service.

COST SHARING

The total project cost is estimated to be $470,176. Forty percent or $188,103 will be borne by other than Public Law 566 funds. The remaining 60 percent or $282,073, will be provided from Public Law 566 funds.

The following costs will be paid by other than Public Law 566 funds:

1. The cost of applying land treatment measures on non-Federal land amounting to $138,214. Of this amount $94,714 is for cropland and pasture practices, and $43,500 is for forestry practices.

   The cost of applying land treatment measures estimated to be $89,774 for cropland and pasture practices and $33,960 for forestry practices will be borne by local landowners and operators.

   State funds will provide $8,700 for technical assistance on forestry practices, and tree planting stock with an estimated value of $840.

   Other state and Federal programs will provide technical assistance for cropland and pasture practices at an estimated cost of $4,940.

   It is expected that landowners and operators will utilize cost-sharing assistance made available under the Agricultural Conservation Program through the Hampden County Agricultural Stabilization and Conservation Committee. The Clarke-McNary Act and the Cooperative Forest Management Act will make substantial contributions to the program during the five-year installation period. It is further expected that such cost-sharing assistance as will be available under other Federal and State programs will be utilized.

2. The cost of providing land, easements and rights-of-way estimated to be $35,462. This includes $3,459 allocated to fish and wildlife enhancement in the Arm Brook site.

3. The cost of administering contracts estimated to be $2,073. This includes $210 allocated to fish and wildlife enhancement in the Arm Brook site.

4. The non-Federal portion of construction costs allocated to fish and wildlife enhancement in the Arm Brook site, estimated to be $12,354.

5. The annual cost of operating and maintaining the structural works of improvement, estimated to be $1,200. This includes $137 allocated to fish and wildlife enhancement in the Arm Brook site.

The following costs will be paid by the Federal government from Public Law 566 funds:

1. The cost of providing the technical assistance needed to accelerate the land treatment measures on non-Federal land, estimated to be $15,000. Of this amount $6,300 will be used by the Soil Conservation Service and $8,700 by the U. S. Forest Service.

2. The cost of installation services associated with the structural works of improvement, estimated to be $72,155. This includes $7,377 allocated to fish and wildlife enhancement in the Arm Brook site.

3. The construction cost of structural measures, estimated to be $194,918. This includes $8,645 allocated to fish and wildlife enhancement in the Arm Brook site.

CONFORMANCE OF PLAN TO FEDERAL LAWS AND REGULATIONS

The Powdermill Brook Watershed is a tributary of the Westfield River. The project contained herein is a logical step in the comprehensive development of the Westfield River, which is a tributary of the Connecticut River.

This work plan conforms to all applicable State and Federal laws, including provisions of the Soil Bank Act, Public Law 540, 84th Congress, as amended.

SECTION 2

INVESTIGATIONS, ANALYSES, SUPPORTING TABLES AND MAPS

LAND TREATMENT MEASURES

Total land treatment needs have been estimated by work unit personnel by studying aerial photographs of the watershed and by ocular observation of most of the land currently in farm crop production. The total program planned for installation over the five-year period was based on estimates of what the cooperators would accomplish if adequate technical assistance were available giving due consideration to the added stimulus from the watershed project. The acreage, number of cooperators and number of basic plans in the watershed area were prorated against the totals for the Soil Conservation Districts to determine the level of the going program in the watershed.

The difference between the planned program and the going program determined the accelerated program which is included in this work plan. Technical assistance needed for the accelerated program was determined by using current work unit rates for planning and application activities.

HYDRAULICS AND HYDROLOGY

General

Procedures and criteria used in the development of the hydrologic and hydraulic phases of the work plan are outlined in National Engineering Handbook, Section 4, Hydrology, Supplement A and other Soil Conservation Service technical guides and memorandums.

The "Diane" flood of August 19, 1955, was used as a basis in the damage analysis of the watershed. The discharges and damages in the watershed were increased considerably in this storm by the failure of two railroad embankments across the valley directly upstream of the damage area. This failure was caused primarily by the limited capacity of the culverts through the embankments. These two culverts have both been replaced with larger pipes which subsequent studies show to be adequate. The effect of this change was recognized in the evaluation of flood flows and damages.

Frequency Data

Rainfall versus frequency relationships were derived from U. S. Weather Bureau, Technical Paper No. 29. Soil-cover complex numbers were computed from information furnished by the Soil Conservation Service and the U.S.D.A. Forest Service. Runoff data was obtained using the above information and E&WP Unit Engineering Memorandum No. 36, Hydrology No. 4.

A monthly distribution of flood probability was developed from stream flow records in the area for agricultural damage appraisals.

Evaluation Routing

The runoff from the two year, twenty year, and one hundred year storms were stream routed to the damage areas. The watershed above the damage area was divided into nine sub-watersheds. Synthetic hydrographs were developed for each sub-watershed for the three storms. These hydrographs were stream routed through successive sub-watersheds using Wilson's method as outlined in NEH-4A. The peak discharges at the damage point were plotted to obtain a discharge frequency curve which was used in the economic evaluation of the watershed.

The effect of land treatment measures was computed using the change in complex curve number by the procedure described in E&WP Unit Memorandum No. 34, Hydrology No. 3.

The same three storms of the evaluation series were routed to determine the peak flows with the proposed project. The hydrographs were graphically flood routed through the two retarding structures by Method No. 2, NEH-5, Hydraulics. The outflow from the structures were then stream routed to the damage area by Wilson's Method. The future discharge versus frequency curve was developed using the peak flows from these three storms.

Key Storm Routings

The storm of August 18 and 19, 1955, was reproduced from local rainfall records. The recorded rainfall for this storm was 19.76 inches in 34 hours. The sub-watershed hydrographs were developed using one hour increments. These hydrographs were stream routed to the damage reaches by Wilson's Method. The storm peak discharges were checked at the new railroad culverts to determine if the embankments would be endangered. Study revealed that the capacity of the culverts is sufficient to protect the embankments for a reoccurrence of this storm. This study was based upon stream hydraulics with no excessive debris problem or other unforseeable adverse conditions. The structures proposed in this plan would give added protection to the embankments.

The "Diane" storm was also routed under future conditions to determine the safety of the proposed structures. The storm was graphically flood routed through the sites. These routings proved that a reoccurrence of the "Diane" storm would not endanger the structures.

Rating Curves

Water surface profiles were used to develop rating curves for the damage reaches. A one-foot contour topographic map was made of the floodplain from Sandy Hill Road to North Elm Street. Cross-sections were taken from this map. Additional cross-sections were surveyed as needed above North Elm Street. Water surface profiles were computed for four discharges from Sandy Hill Road upstream to the upper railroad culvert, using the Step Method as outlined in NEH-4A. The backwater effect of the Westfield River on these profiles was considered. Rating curves were developed from these profiles.

Evaluation

An evaluation series of stage versus percent chance was prepared for each reach. The evaluation series was taken to a 500 year frequency for the residential and commercial damages. The area inundated by storms up to a 20 year frequency were plotted on the topographic map for the agricultural damage evaluation. Storms of less frequent occurrence may coincide with backwater from the Westfield River. Therefore, no evaluation was made for storms of greater magnitude. Agricultural benefits would be derived from larger storms which do not coincide with backwater from the Westfield River. These benefits have not been evaluated.

Structures

The 100 year floodwater detention requirements for the two floodwater retarding structures were determined by the procedure in Technical Release No. 10. The maximum volume of storage required was based on a 55 hour and a 70 hour storm for the Arm Brook site and Powdermill Brook site respectively. These requirements were greater than those determined by routing the 6 hour, 100 year rainfall hydrograph through the sites using antecedent moisture condition III. Hydrographs for emergency spillway and freeboard design were developed following the recommended criteria in E&WP Unit Memorandum No. 47, Hydrology No. 7.

ECONOMICS

Damage Appraisals

A complete damage survey was conducted within the flood plain of the Powdermill Watershed. Ninety-eight appraisals, keyed to the flood stage of hurricane "Diane", August 19, 1955, were collected. Damage estimates were made by one-foot increments below the stage of the key storm to the elevation where there was no remaining property damage. Damages were estimated at a 1961 price base and converted to long-term price projections.

Some sediment damage occurs to agricultural land within the watershed. This was included in the floodwater damage appraisal and not considered separately.

The indirect damages were estimated to be 20% of the direct damages for residential and commercial and 15% for agricultural in accord with Chapter 3, Economics Guide.

Evaluation

Average annual damages and benefits were computed using the frequency method described in Chapter 3 of the Economics Guide.

The floodwater retarding structure and the floodwater retarding-fish and wildlife enhancement structure were evaluated as one unit because of their interdependence to a common damage center

Residential, commercial and utility damages were tabulated for each hydraulic reach. They were evaluated up to a 500 year storm.

Agricultural damages are confined within Reach 2 and were evaluated separately. Present cropping pattern, yield levels and cultural practices were obtained from local farmers, Soil Conservation Service technicians, State and Federal market service and extension service. Damage rates were established by fifteen-day intervals for the growing season. Monetary values were computed in accordance with Economic Guide.

Agricultural damages were evaluated only up to the 20 year storm due to the possible effect of backwater from the Westfield River.

Cost Allocation

The Arm Brook structure will be multiple purpose for flood prevention and fish and wildlife enhancement. Allocation of costs by purposes were computed by the use-of-facilities method. The structure provides for 8 acre-feet for sediment storage, 142 acre-feet for fish and wildlife purposes, and 581 acre-feet for floodwater storage. The sediment storage was prorated to flood prevention and fish and wildlife enhancement in proportion to the storage provided for each of these purposes.

Computation of Total Cost Allocation

	Flood Prevention	Fish and Wildlife Enhancement	Total
1. Capacity, including allocated sediment	587.43	143.57	731
2. Percentages to be used for joint costs	80.36	19.64	100
3. Total allocated costs*	$131,118	$32,045	$163,163

*There were no specific costs for this structure.

The cost of each installation item is allocated to each purpose using the same percentages as were used to allocate the total cost, as follows:

Computation of Allocation of Cost of Installation Items by Purpose

Installation Item	Flood Prevention (80.36%)	Fish and Wildlife Enhancement (19.64%)	Total
1. Construction	85,921	20,999	106,920
2. Installation Services	30,185	7,377	37,562
3. Administering Contracts	859	210	1,069
4. Land, easements & rights-of-way	14,153	3,459	17,612
Totals	131,118	32,045	163,163

Of the $32,045 allocated to fish and wildlife enhancement, $16,022 will be provided from Public Law 566 funds and $16,023 from other funds.

Computation of Cost Sharing

Installation Item	P. L. 566 Funds: Flood Prevention	P. L. 566 Funds: Fish & Wildlife Enhancement	P. L. 566 Funds: Total	Other Funds: Flood Prevention	Other Funds: Fish & Wildlife Enhancement	Other Funds: Total
1. Construction	85,921	8,645	94,566	-	12,354	12,354
2. Installation Services	30,185	7,377	37,562	-	-	-
3. Administering Contracts	-	-	-	859	210	1,069
4. Land, easements & rights-of-way	-	-	-	14,153	3,459	17,612
Totals	116,106	16,022	132,128	15,012	16,023	31,035

Land, Easements and Rights-of-way

The local organization estimated the cost at $238 per acre. This is an average cost per acre for all property needed to install structural measures. It also includes estimated cost of fees and services.

GEOLOGY

Structure Site Investigation

A preliminary examination of the proposed sites reveals many similar characteristics. Both sites are located in an area of intense glaciation. The unconsolidated material consists of till and stratified deposits of glacio-lacustrine origin. The till ranges from clays and silts to large boulders several feet in thickness. Valley bottoms range from a mantle of compressible alluvial silts and clays to sands and gravels. It is possible that the compressibility of materials may require intense investigation.

Arm Brook site is planned to be a multiple-purpose structure. Preliminary geologic investigation revealed an impermeable layer of silts which would prevent excessive leakage.

Sediment and Erosion Studies

Sediment damage in the watershed is negligible being confined to infertile overwash and some scouring. These sediment damages were not of sufficient extent to warrant a detailed survey and are included as floodwater damages.

The Probable Soil Loss Formula was used in computing the sediment storage requirement for each structure. Trap efficiency was obtained from the trap efficiency curve ESNE-29 using the medium curve.

STRUCTURE INVESTIGATION

Floodwater Retarding and Multiple Purpose Structures

The engineering, hydrologic, geologic, and economic studies made of this watershed led to the selection of the two structures described in this plan as the best solution to the flood problems.

The structures were proportioned in accordance with Soil Conservation Service criteria defined in SCS Engineering Memorandum 27 (Revised) and as recommended in E&WP Engineering Memorandum #47, Hydrology #7. The procedures used are described in National Engineering Handbook, Section 5 and Technical Release #2.

Principal Spillways

The reinforced concrete pipe principal spillways were proportioned to produce outflows consistent with available storage and the downstream channel capacity. Both sites have one-stage, reinforced concrete risers. The riser crest for the Powdermill site is set at an elevation which will provide for an estimated 50-year sediment accumulation. An opening of the bottom of the riser will provide for passing normal flow. The crest of the Arm Brook riser is at an elevation which will provide for storage desired for fish and wildlife enhancement in addition to 50-year sediment accumulation.

Emergency Spillways

The emergency spillways will have a short length of level section, an entrance channel on an adverse grade, and an exit channel on a steep slope. The exit channels are straight until they are beyond the downstream toe of the dam.

The emergency spillways were proportioned by the procedure outlined in Technical Release #2. The proportions were then checked by a graphical flood routing. The stage discharge curve was prepared from water-surface profiles for various discharges.

Field Surveys

Transit and plane table were used in making topographic surveys of the two structure sites, and in running centerline profiles of the two dams. The topographic surveys were used to develop stage-storage and stage-area curves for the structural layouts. Profiles of the centerline of the dams were used in estimating earth fill quantities.

TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION
Powdermill Brook Watershed
Massachusetts

Structure Site Name	Installation Costs - PL 566 Funds					Installation Costs - Other Funds					Total Instal-lation Cost
	Construction		Instal. Services		Total	Construction		Other		Total	
	Engineers Estimate	Contin-gencies	Engin-eering	Other	PL 566 Funds	Engineers Estimate	Contin-gencies	Adm. of Contract	Easements & R.of W.	Other Funds	
Arm Brook	78,805	15,761	27,579	9,983	132,128	10,295	2,059	1,069	17,612	31,035	163,163
Powdermill Brook	89,600	10,752	25,223	9,370	134,945			1,004	17,850	18,854	153,799
GRAND TOTAL	168,405	26,513	52,802	19,353	267,073	10,295	2,059	2,073	35,462	49,889	316,962

Price Base 1961

August 1961

TABLE 3 - STRUCTURE DATA
Floodwater Retarding Structures
Powdermill Brook Watershed - Massachusetts

ITEM	UNIT	ARM	POWDERMILL	TOTAL
Drainage Area	Sq. Mi.	3.4	4.6	8.0
Storage Capacity				
Sediment	Ac. Ft.	8	15	23
Fish and Wildlife	Ac. Ft.	142	---	142
Floodwater Detention	Ac. Ft.	581	966	1,547
Total	Ac. Ft.	731	981	1,712
Surface Area				
Sediment Pool	Ac.	2	5	7
Fish and Wildlife Pool	Ac.	13	----	13
Flood Detention Pool	Ac.	56	56	112
Volume of Fill	Cu. Yds.	77,200	100,000	177,200
Elevation Top of Dam	Ft.	218.5	202.5	---
Maximum Height of Dam	Ft.	56	47	---
Emergency Spillway				
Crest Elevation	Ft.	213.5	197.0	---
Bottom Width	Ft.	184	260	---
Type	-	Earth	Earth	---
Percent Chance of Use	-	1.0	1.0	---
Aver. Curve No.-Con'd II	-	68	68	---
Emergency Spillway Hydrograph				
Storm rainfall (6 hr.)	In.	15.2	15.0	---
Storm runoff	In.	10.7	10.5	---
Velocity of Flow (v_c) 1/	Ft./sec.	8.0	8.0	---
Discharge rate 1/	c.f.s.	3,060	4,200	---
Max. w.s. elev. 1/	Ft.	217.0	200.5	---
Freeboard Hydrograph				
Storm rainfall (6 hr.)	In.	21.7	21.4	---
Storm runoff	In.	16.9	16.6	---
Velocity of Flow (v_c) 1/	Ft./sec.	9.0	9.5	---
Discharge rate 1/	c.f.s.	5,540	7,900	---
Max. w.s. elev. 1/	Ft.	218.5	202.3	---
Principal Spillway				
Capacity at E.S. Crest	c.f.s.	271	330	---
Capacity Equivalents				
Sediment volume	In.	0.04	0.06	---
Detention volume	In.	3.3	4.0	---
Spillway storage	In.	1.1	0.8	---
Class of Structure	-	c	c	---

1/ - Maximum during passage of hydrograph.

TABLE 4 - SUMMARY OF PHYSICAL DATA
Powdermill Brook Watershed
Massachusetts

Item	Unit	Future Without Project	Future With Project
Watershed Area	Sq. Mi.	20.0	---
Watershed Area	Acre	12,825	---
Area Privately Owned	Acre	12,055	11,906
Area Non-Federal Public	Acre	770	919
Area of Cropland	Acre	1,339	1,339
Area of Woodland	Acre	7,725	7,712
Area of Grassland	Acre	1,025	1,025
Area of Farmstead & Urban	Acre	1,885	1,885
Area in Ponds, Streams, Lakes, etc.	Acre	260	273
Area of Brush & Idle	Acre	591	591
Average Annual Rainfall	Inches	47	---

August 1961

TABLE 5 - SUMMARY OF PLAN DATA
Powdermill Brook Watershed
Massachusetts

ITEM	UNIT	QUANTITY
Years to Complete Project	Year	5
Total Installation Cost		
Public Law 566 Funds	Dollar	282,073
Other Funds	Dollar	188,103
Annual O & M Cost		
Non-Federal	Dollar	1,200
Average Annual Monetary Benefits 1/	Dollar	17,582
Agricultural	Percent	10.6
Non-Agricultural	Percent	89.4
Structural Measures		
Floodwater Retarding Structures	Each	1
Multiple Purpose Structures	Each	1
Area Inundated by Retarding Structures		
Sediment Pool	Acre	7
Fish and Wildlife Pool	Acre	13
Detention Pool	Acre	112
Watershed Above Retarding Structures	Acre	5,076
Reduction of Floodwater Damage	Dollar	18,981
By Land Treatment Measures for Watershed Protection	Dollar	1,399
By Structural Measures	Dollar	17,582

1/ From Structural Measures

Price Base 1961

August 1961

TABLE 6 - ANNUAL COSTS
Powdermill Brook Watershed
Massachusetts

Measures	Amortization of Installation Costs	O & M Costs Non-Federal	Other Economic Costs	Total
Evaluation Unit No. 1				
Floodwater Retarding Structure:				
Powdermill Brook	5,558	500		6,058
Multiple Purpose Floodwater Retarding and Fish and Wildlife Enhancement Structure:				
Arm Brook	4,739	563		5,302*
TOTAL	10,297	1,063**		11,360

Amortized at 2 5/8% for 50 years.

* Does not include $1,158 amortized installation costs and $137 annual operation and maintenance for fish and wildlife enhancement.

** O and M long term price level as projected by Agricultural Research Service, Price Projection, September 1957.

August 1961

TABLE 7 - MONETARY BENEFITS FROM STRUCTURAL MEASURES
Powdermill Brook Watershed
Massachusetts

Dollars 1/

Item	Estimated Average Annual Damages			Average Annual Monetary Benefits
	Without Project	After Land Treatmant For W/S Protection	With Project	
Floodwater Damages				
Agricultural 2/	2,148	1,984	124	1,860
Retail & Commercial	10,999	10,201	22	10,179
Residential	2,711	2,515	5	2,510
Bridge, Road, etc.	195	180	0	180
Subtotal	16,053	14,880	151	14,729
Indirect Damages	3,103	2,877	24	2,853
Total All Damages	19,156	17,757	175	17,582

1/ Price base long term price level as projected by Agricultural Research Service, Price Projection, September 1957.

2/ Damages were not evaluated for flood events less frequent than the 20-year flood (see page 14).

August 1961

TABLE 8 - BENEFIT-COST ANALYSIS
Powdermill Brook Watershed
Massachusetts

Measures	Average Annual Benefits					Average Annual Cost	Benefit Cost Ratio
	Flood Prevention			Non-Agr. Water Mgmt.			
	Floodwater	Indirect	Changed Land Use	Fish & Wildlife Enhancement	Total		
EVALUATION UNIT NO. 1							
1 Floodwater Retarding Structure:							
Powdermill Brook							
1 Multiple Purpose Floodwater Retarding and Fish & Wildlife Enhancement Structure:							
Arm Brook							
Total	14,729	2,853	---	---	17,582	11,360	1.5 to 1*
GRAND TOTAL	14,729	2,853	---	---	17,582	11,360	

* Benefits for fish and wildlife are not evaluated and, therefore, neither the cost nor benefits for this purpose appear in the benefit cost ratio.

Price base long term price level as projected by Agricultural Research Service, Price Projection, September 1957.

August 1961

TABLE 9
ALLOCATION OF INSTALLATION COSTS OF STRUCTURAL MEASURES
Powdermill Brook Watershed
Massachusetts
(Dollars)

Item	Purpose		Total
	Flood Prevention	Fish & Wildlife Enhancement	
STEP A			
One Floodwater Retarding Structure (Powdermill)	153,799	---	153,799
One Multiple Purpose Floodwater Retarding and Fish & Wildlife Enhancement Structure (Arm)	131,118	32,045	163,163
TOTAL	284,917	32,045	316,962
STEP B			
P. L. 566	251,051	16,022	267,073
Other	33,866	16,023	49,889
TOTAL	284,917	32,045	316,962

Price Base 1961

August 1961

TABLE 10 - BENEFITS FROM WORKS OF IMPROVEMENT BY REACHES

Powdermill Brook Watershed
Massachusetts

Damage Reach	Drainage Area Above Reach	Discharge At Which Damage Begins	Present Conditions			Future Conditions		
			Peak Flow 100-Year Flood	Damages 100-Year Flood	Average Annual Damages	Peak Flow 100-Year Flood	Damages 100-Year Flood	Average Annual Damages
	Acres	c.f.s.	c.f.s.	Dollars	Dollars	c.f.s.	Dollars	Dollars
1	5,700	1,850	2,365	116,500	3,707	780	0	0
2	6,400	550	2,400	96,490	15,449	800	1,148*	175

* Agricultural

August 1961

Saloomey Dam

1926 Westfield

Note issues concerning Sherman Mill Bridge - on Little River Road, Route 187 - dam is located one thousand feet upstream from mouth of Great River.

Bridges	Sherman Mill Bridge
City/Town	Westfield
Dam	Saloomey Dam
Name	Massachusetts Comm Public Works
Streets	Route 187
Streets	Little River Road
Water	Great River

February 17, 1926

S. Saloomey,
Little River,
Westfield, Mass.

Dear Sir:

In accordance with the provisions of Section 45 of Chapter 253 of the General Laws as amended by Chapter 334 of the Acts of 1923 and as further amended by Chapter 178 of the Acts of 1924 relative to the inspection, condition and safety of the dams of Hampden County, you are notified that your dam, located on Great Brook, so-called, in that part of the City of Westfield known as Little River, has been inspected by our engineer and your attention is called to the following recommendations made by him;

> "There is some leakage through the structure especially around the penstock which is laid to the gristmill, and near its center where the waste gate, for emptying the pond, is located. The owner stated he would repair these leaks and the whole structure the coming year."

Now, therefore, in accordance with Section 46 of said Chapter 253, it is ordered that the above recommendations be complied with in a reasonable time.

Yours very truly,

COUNTY COMMISSIONERS

By ____________________
Chairman.

____

____

May 17, 1933

Mr. S. Saloomey,
Little River,
Westfield, Mass.

Dear Sir:

In accordance with the provisions of Section 45 of Chapter 253 of the General Laws as amended by Chapter 334 of the Acts of 1923 and as further amended by Chapter 178 of the Acts of 1924 relative to the inspection, condition and safety of the dams of Hampden County, you are notified that your dam, located on Great Brook, so called, in the City of Westfield, has been inspected by our engineer and your attention is called to the following conditions noted and recommendations made by him;

> "On the date of inspection this dam showed considerable leakage at the center of the structure along the foundation and between the foundation and the crest. If the pond formed thereby is to be maintained the dam should be repaired and the leakage stopped. Otherwise the pond should be drawn down and the dam removed or a substantial opening made therein for the free passage of the brook. The crest of the dam should be kept clean at all times and logs or debris of any kind carried by the stream and deposited thereon should be removed at once."

Now, therefore in accordance with Section 46 of said Chapter 253, it is ordered that the above recommendations be complied with in a reasonable length of time.

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By______________________
Chairman.

____

____

Commonwealth of Massachusetts

County of Hampden

Springfield, Mass.

Office of the
County Commissioners

Thomas J. Costello
Chairman
Charles M. Bray
Edward J. Stapleton

August 27, 1941

Mr. S. Saloomey
Little River Road
Westfield, Mass.

Dear Sir:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby notified that your dam on Great Brook in Westfield has been inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "Although repairs were made on this structure a couple of years ago, nevertheless, it shows considerable leakage now, which should be repaired."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By Thos J. Costello
Chairman
Charles M Bray
Edward J. Stapleton

When I repaired the dam
I did not use matched planks that is why
you find some leakage we expect to fix
the leakage soon. I thank you for calling
my attention to it

S. S. Saloomey.

August 27, 1941

Mr. S. Saloomey
Little River Road
Westfield, Mass.

Dear Sir:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby notified that your dam on Great Brook in Westfield has been inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "Although repairs were made on this structure a couple of years ago, nevertheless, it shows considerable leakage now, which should be repaired."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By ______________________
Chairman

____

____

October 3, 1945

Mr. S. S. Saloomey
Little River Road
Westfield, Mass.

Dear Sir:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam located on Great Brook in the City of Westfield has been inspected by our engineer and your attention is called to the following conditions noted and recommendations made by him;

> "Although some repairs have been made on this deck spillway structure considerable repairs are still needed before the structure is in proper condition."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By____________________
Chairman

____

____

Mr. Bond brought this letter in to the Commissioners' office on April 21,1949. A letter was typed on County stationery and Mr. Bray who came in the latter part of the afternoon, signed it. Mr. Sullivan came in Friday afternoon and signed it. Mr. Stapleton could not be reached as there was no answer at his house.

Mr. S. Saloomey
The Grey Lodge
93 Main Street
Westfield, Mass.

Dear Sir:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised, that the dam belonging to you and located on Great Brook in the City of Westfield, has been inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him:

> "In a recent inspection made of the Saloomey Dam in Westfield, it was found that the wooden post structure is in a dilapidated condition. Struts supporting the deck have been removed, and the dam may disintegrate and break up at the next high water. The failure of the dam may cause undermining and washing of bridge piers and footings of the Little River Road Bridge. Debris from the collapse of the dam may cause choking up of Great Brook, between the dam location and the Westfield River, causing flood and property damage. The dam should be repaired immediately or breached to allow for free passage of the stream."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By ______________________
Chairman

____

____

"Saloomey Dam"

The Commonwealth of Massachusetts

Department of Public Works

M-Westfield

Sherman Mill Bridge

191 Main Street
Greenfield, Mass.,
Feb 16, 1949

Thomas F. Sullivan, Chairman
Hampden County Commissioners
Springfield, Mass.

Dear Sir:

An inspection of the Sherman Mill Bridge, so-called, on Little River Road, Route 187, Westfield, was made recently - to determine if any damage was sustained from the "flash" flood of January 1st, 1949.

A wooden dam on the north side of the structure, within the limits of the wing walls, was found to be in a very dilapidated condition.

This dam is known as the "Saloomey Dam" and is 1000 ft upstream from the mouth of Great River. It is a post deck spillway structure, the crest of which is 10 ft north of the north line of the bridge. The length of the spillway is 55 ft and its height is 11.0 ft above the bed of the stream. The dam is in a very poor state and if it is to be maintained, it should be rebuilt entirely.

The pond formed upstream was formerly used as an ice pond, but has not been in use for many years. Penstocks were attached to both ends of the structure at one time and supplied water power to a grist mill and sawmill. These were both destroyed by fire. The grist mill burned down about 1922 and the sawmill about 1930.

The pond formed by this dam and normal working conditions covers about two acres. The area drained through this structure is 25 1/4 square miles. A discontinued structure in such condition as this one is at the present time, does not form a pond, due to the free waterway through, under and around it.

It has not been kept in repair by its owner, SHAHEED S. SALOOMEY of Little River Road, Westfield, and the waterway has been allowed to become blocked with all forms of debris. It has become a hazard to the bridge structure and a high flood flow might cause a washout under the bridge footings.

It is recommended that action be instigated as soon as possible, to determine what disposition is to be made of the existing structure and what steps must be taken to correct the existing conditions.

It is my understanding that under existing laws of this State, no dams of this size may be demolished without permission of the County having jurisdiction over them.

The Commonwealth of Massachusetts

Department of Public Works

M-Westfield
2--Mr Thomas F. Sullivan

Greenfield, Mass.,
Feb 16, 1949

If this structure is removed, it will be necessary to construct a stone and concrete spillway at the same location, to safeguard the present bridge.

In order to prepare for any flood emergency during the next four months, it is suggested that immediate action on this matter be taken and this office advised as soon as possible.

Very truly yours,

C B Raymond.

C. B. RAYMOND
District Highway Engineer

WC-t
C-J McGovern
R O Spofford
J E Lawrence
H A Corr
W W Compton

Copy of this letter mailed to Philip E. Bond, Hydraulic Engineer for Hampden County, on February 25, 1949.

JAMES L. TIGHE
PHILIP E. BOND

TELEPHONE
HOLYOKE 5525

TIGHE & BOND
CONSULTING ENGINEERS
189 HIGH STREET
HOLYOKE, MASSACHUSETTS

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
WATER POWER
DAMS

March 11, 1949

The Hon. The Board of County Comm'rs
Hampden County Court House
Springfield, Mass.

Attention: Mr. Thomas F. Sullivan Chr.

I submit the following memorandum relative to the Saloomey Dam on Great Brook in Westfield.

Memorandum

The Saloomey Dam is a wooden post deck structure ten feet in height and forms a pond covering about two acres. In the recent past the pond was used as an ice pond but today has no commercial use. The Dam has not been maintained for some years and is in a dilapidated condition. The owner, Mr. Saloomey, stated in 1947 and 1948 that he intended to remove the Dam for the salvage value of the timber, if help was available.

Mr. Saloomey intends to remove the Dam this year and states that help is now available due to the mills in Westfield working part time. The removal of this Dam might endanger the footings of the bridge on Little River Road.

I talked with Mr. Raymond District Engineer of the State Highway Department, and stated to him that it is my understanding that the County could only order Mr. Saloomey to make repairs to the structure or remove the structure and allow free passage of the stream.

Mr. Raymond is interested in having the dam remain in place at the present time and requests that no action be taken relative to his letter at this time. Due to the type of construction and the location of this dam, about 1,000 feet from the mouth of Little River, Mr. Raymond's request involves little or no public danger.

The State Highway Department wishes time to make further studies at this location so as to be prepared to construct a low dam to protect the bridge footings when Mr. Saloomey tears down his structure.

Very truly yours,

Philip E. Bond
County Hydraulic Engineer

JAMES L. TIGHE
PHILIP E. BOND

TELEPHONE
HOLYOKE 5525

TIGHE & BOND
CONSULTING ENGINEERS
189 HIGH STREET
HOLYOKE, MASSACHUSETTS

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
WATER POWER
DAMS

April 21, 1949

The Hon. The Board of County Comm'rs
Hampden County Court House
Springfield, Mass.

Attn: Mr. Thomas F. Sullivan, Chairman

Gentlemen:

Reference is made to my memorandum, dated March 11, 1949, relative to the Saloomey Dam on Great Brook in Westfield.

I have talked today with Mr. Raymond, State Highway Department, District Engineer. He is now interested in having this dam put in safe condition, or removed to allow for free passage of Great Brook at this location.

Enclosed find the necessary letter to Mr. Saloomey relative to making immediate repairs to the structure, or removing the structure to allow for free passage of the stream.

Very truly yours,

Philip E. Bond
County Hydraulic Engineer

Enclosure: Copy of March 11, 1949 memorandum.

April 22, 1949

Mr. S. Saloomey
The Grey Lodge
93 Main Street
Westfield, Mass.

Dear Sir:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised, that the dam belonging to you and located on Great Brook in the City of Westfield, has been inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him:

> "In a recent inspection made of the Saloomey Dam in Westfield, it was found that the wooden post structure is in a dilapidated condition. Struts supporting the deck have been removed, and the dam may disintegrate and break up at the next high water. The failure of the dam may cause undermining and washing of bridge piers and footings of the Little River Road Bridge. Debris from the collapse of the dam may cause choking up of Great Brook, between the dam location and the Westfield River, causing flood and property damage. The dam should be repaired immediately or breached to allow for free passage of the stream."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By Thomas F. Sullivan
Chairman

Charles W. Bray

April 22, 1949

Mr. S. Saloomey
The Grey Lodge
93 Main Street
Westfield, Mass.

Dear Sir:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised, that the dam belonging to you and located on Great Brook in the City of Westfield, has been inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him:

> "In a recent inspection made of the Saloomey Dam in Westfield, it was found that the wooden post structure is in a dilapidated condition. Struts supporting the deck have been removed, and the dam may disintegrate and break up at the next high water. The failure of the dam may cause undermining and washing of bridge piers and footings of the Little River Road Bridge. Debris from the collapse of the dam may cause choking up of Great Brook, between the dam location and the Westfield River, causing flood and property damage. The dam should be repaired immediately or breached to allow for free passage of the stream."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By Thomas F. Sullivan
Chairman

Charles W. Bray

April 27, 1949

C. B. Raymond, Esq.
District Highway Engineer,
Commonwealth of Massachusetts,
191 Main Street,
Greenfield, Mass.

Attention: Mr. Compton

Dear Mr. Raymond:

Reference: Your letter dated February 16, 1949.

Permission to demolish the Saloomey dam was granted this date at a meeting of the Hampden County Commissioners.

Mr. Shaheed S. Saloomey of Westfield, owner of the dam in question, has agreed to the complete removal of the dam structure, and in addition, has agreed to permit the Commonwealth of Massachusetts, Department of Public Works, Division of Highways, to remove this structure at any time prior to June 30, 1949, provided that the removal is accomplished at no cost to the dam owner.

We are enclosing for your information a copy of a letter signed by Mr. Saloomey this date with respect to this matter.

Very truly yours,

COUNTY COMMISSIONERS

By ______________________
Chairman.

WJF/N
Encl.

Copy of this letter mailed to Philip E. Bond, County Hydraulic Engineer, on April 27, 1949.

93 Main Street,
Westfield, Mass.

April 27, 1949

County Commissioners
County of Hampden
Court House
Springfield, Mass.

Gentlemen:

In accordance with your letter of April 22, 1949 with respect to the conditions of the Saloomey dam in Westfield, said dam being owned by me, I agree to the complete removal of the dam structure. I further agree to permit the Commonwealth of Massachusetts, Department of Public Works, Division of Highways, to remove this dam structure at any time prior to June 30, 1949 at no cost to myself for said removal.

The removal of the dam structure in no way causes me to loose the water rights appertaining to my land, the land owned by me as of this date, April 27, 1949.

Yours very truly,
Shaheed S. Saloomey

Shaheed S. Saloomey

93 Main Street,
Westfield, Mass.

April 27, 1949

County Commissioners
County of Hampden
Court House
Springfield, Mass.

Gentlemen:

In accordance with your letter of April 22, 1949 with respect to the conditions of the Saloomey dam in Westfield, said dam being owned by me, I agree to the complete removal of the dam structure. I further agree to permit the Commonwealth of Massachusetts, Department of Public Works, Division of Highways, to remove this dam structure at any time prior to June 30, 1949 at no cost to myself for said removal.

The removal of the dam structure in no way causes me to loose the water rights appertaining to my land, the land owned by me as of this date, April 27, 1949.

Yours very truly,
Shaheed S. Saloomey

Shaheed S. Saloomey

93 Main Street,
Westfield, Mass.
April 25, 1949

County Commissioners
County of Hampden
Court House
Springfield, Mass.

Gentlemen:

I acknowledge receipt of your letter of April 22, 1949, pertaining to the condition of the dam owned by me and located on Great Brook in the City of Westfield.

In compliance with your request, I will have the dam breached to allow for free passage of the stream, within a reasonable time, as soon as the water level goes down.

Yours very truly,

Shaheed S. Saloomey
S. S. Saloomey

Sandy Mill Brook Dam

- Westfield

Also see: Dam Report Section - Westfield.

City/Town	Westfield
Dam	Sandy Mill Brook Dam
Name	Westfield City Parks
Water	Sandy Mill Brook

WESTFIELD
D21025

SANDY MILL BROOK DAM

D21025

NO IMAGE ON FILE FOR THIS RECORD

(INFORMATION EXISTS ONLY ON A FILE CARD FROM THE OFFICE OF THE FORMER HAMPDEN COUNTY ENGINEER.)

Smit Dam

1970 Westfield

Pond near the Westfield Little River southwest of Stanley Park.

Abutters	Stanley Park
Bridges	Horton's Bridge
City/Town	Westfield
Dam	Steven Paper Mill Company Mill Dam
Dam	Smit Dam
Dam	Smit Project at Little River
Name	Smit
Streets	Granville Road
Water	Loomis Street
Water	Little River

ANDERSON, BERNDT, ANTONELLIS & LARSEN
ATTORNEYS AT LAW
55 COURT STREET
WESTFIELD, MASSACHUSETTS
01085

ANDREW ANDERSON
DAVID A. BERNDT
CARL J. ANTONELLIS, JR.
OLAF LARSEN

TELEPHONE
568-1638
AREA CODE 413

February 4, 1970

Mr. George MacDonald
Tigne & Bond, Inc.
211 Bowers Street
Holyoke, Massachusetts 01040

Dear Mr. MacDonald:

Re: Smit Project - Westfield, Mass.

Thank you for coming to my office on Monday, January 12, 1970 to discuss the Smit Project. Per your request I am herewith enclosing two (2) copies of the site plan of Mr. Smit's construction (excavation) of a pond near the Westfield Little River.

As shown on the plan, he is going to construct a concrete dam on a tributary, the dam not to exceed two and one-half (2½) feet in height. The dam will have a sluice gate allowing for the normal flow of the stream when open. The sluice gate would only be closed when water was needed to fill the excavated pond to a level suitable for swimming from the proposed beach area. The dam itself will not cause the upstream to rise in elevation to any appreciable or significant degree, a portion of the flow merely being temporarily diverted rather than contained upstream.

As the plan also shows, the water in the pond will flow back into the Little River over a spillway after it has reached the desired level.

Your tentative verbal appraisal of this project was that it probably would not require County Commissioners approval, but you reserved final determination until you had my letter and plans and reviewed the project.

I would appreciate your informing me what your final determination is. Thank you again for your cooperation and help in this matter.

Very truly yours,

DAB/psc
Enclosure

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEfferson 3-3991

CD Westfield
February 17, 1970

The Honorable the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen:

Re: Proposed Pond by Smit
at Little River

At the request of Attorney David A. Berndt, the undersigned met with the attorney at his office in Westfield to review a proposal for the construction of a pond on a portion of Little River in Westfield in the general vicinity of where Loomis Street and Granville Road merge. The site in question is across Little River and slightly southwest of Stanley Park. In relation to the Steven Paper Company mill dam at Horton's Bridge, the proposed pond is approximately 4,000 feet upstream of the dam.

I am attaching hereto, one copy of a portion of the U.S. Topographic Map of the Southwick, Mass - Connecticut Quadrangle. The map shows Little River, the area of Horton's Bridge, Stanley Park and, on the map I have drawn in pencil the approximate location of the proposed pond.

You will note that Little River flows easterly, as indicated by the penciled arrow.

Upstream of Horton's Bridge there is a flat area in the valley of the stream where Little River meanders and numerous side channels have formed.

Munn Brook, a major stream which flows from the south, parallel to Loomis Road, discharges into Little River after the brook flows under Granville Road. Munn Brook joins a branch of Little River just downstream of the location where Mr. Smit proposes the pond construction.

As described to me by Attorney Berndt, the proposed pond would be entirely in excavation and there would be no dam construction at the pond itself. The pond would not be excavated directly in a branch of Little River but on relatively flat ground between the main thread of Little River and the branch which merges with Munn Brook.

In order that there will be a continuous flow of water through the dug pond, it is proposed by Mr. Smit to build a small concrete wall dam across the minor branch or thread of Little River. This small dam, would not exceed 2-1/2 feet in height. The dam would have a sluice gate which would allow for normal flow of the stream to pass the structure when open. When closed, the gate would divert water through a connecting pipeline or channel into the westerly end of the proposed dug pon. Water would overflow from the pond to the main channel of Little River through a small concrete spillway and an outlet or discharge channel.

The only water that would be transferred from the River to the pond would be that portion directed into the pond inlet channel by the proposed small diversion dam structure.

As explained by Attorney Berndt, little water would be impounded above normal stream surface elevation. The minor build-up formed would be only that required to result in continuous flow of water through the dug pond.

I am sending you herewith, one copy of the map of the area sent to me by Attorney Berndt, together with the portion of the U. S. Topographic Map, previously referred to, showing the location of the proposed construction.

In my opinion, the small concrete water diversion structure as proposed might technically be considered a dam. However, since the structure to be built for the purpose of diverting water to the dug pond is to be no higher than 2-1/2 feet, and since it is on a small branch of Mill River rather than on the main thread of the stream, it should not be storing water in a large enough quantity to be of any concern to persons and property downstream.

It is recommended that a communication be sent to Attorney Berndt advising him that based upon his explanation of the project to the undersigned and his letter of February 4, 1970, it would appear that the proposed Smit project would not come under County jurisdiction. However, since the project does entail the construction of a dam which might be 2-1/2 feet above the normal level of Little River and, depending upon how this concrete dam is constructed, it is possible that water might be stored behind the dam in a quantity sufficient to require County review and control, the property owner should provide your Board with a plan of the proposed concrete dam and sluice gate giving dimensions and basic features so that the project can be reviewed more thoroughly in the field prior to construction. Also, the overflow concrete spillway design should be reviewed to be sure all ponded water is in excavation.

Very truly yours,

George H. McDonnell

George H. McDonnell
County Hydraulic Engineer

GHM/amd
Encl.

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

CIVIL,SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS,REPORTS,PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

TIGHE & BOND *CONSULTING ENGINEERS*

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

√

CD Westfield
March 10, 1970

The Honorable the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen: Re: Smit Project, Westfield

I have examined two drawings submitted to your Honorable Board by Attorney Berndt showing the proposed small dam and sluice gate to be installed in one thread or course of Little River in Westfield near the intersection of Granville Road and Loomis Street, and the proposed spillway to serve the pond to be formed in excavation. A report in connection with this project was sent to your Board by the undersigned on February 17, 1970.

Since the pond to be formed by excavation will not, in the opinion of the undersigned, come under County jurisdiction, it is my opinion that the spillway facility need not be considered for review and approval. If the owner changes his plan in any way whereby water is stored by damming, the overflow structure would come under your control.

The undersigned has examined the site of the diversion dam and sluice gate in the field. The diversion dam will store water to a depth of approximately 30" at the location of the diversion dam. This will not create a pond of sufficient size to be of any concern or to endanger persons and property downstream under normal stream flow conditions. The structure as proposed will apparently reduce the thread of the stream of Little River from a width of over 40 ft. to a weir width of only 20 ft. The right side wall of the structure will be 6 ft. high and the top elevation will be 3' 6" above the weir crest. Without having complete details as to how the construction is to be tied into the existing topography, I predict that during high stream flow, the structure as planned may be washed out and the thread of the stream shifted to one side or the other of the structure.

An examination of the stream area this week showed huge cakes of ice on the shore at a height estimated at 5 ft. above normal water level. This evidence indicates to me that in flood flow time, the entire diversion dam may cause a sufficient restriction in the stream bed to result in increased velocity, side erosion and the formation of an alternate channel on one or both sides of the diversion structure.

In my opinion, the owner should be warned of this possibility but I do not see any reason to deny his request to build the diversion structure, since persons and property downstream will not be endangered.

Respectfully submitted,

George H. McDonnell

George H. McDonnell
County Hydraulic Engineer

GHM/amd

Springfield Boy Scouts Dam

- Westfield

Also see: Dam Report Section - Westfield.

Abutters	Robinson Camp
City/Town	Westfield
Dam	Springfield Boy Scouts Dam

WESTFIELD
D21027

SPRINGFIELD BOY SCOUTS DAM

D21027

NO IMAGE ON FILE FOR THIS RECORD

(INFORMATION EXISTS ONLY ON A FILE CARD FROM THE OFFICE OF THE FORMER HAMPDEN COUNTY ENGINEER.)

Springfield Water Works Intake Dam

- Westfield

Also *See* Dam Report Section: Westfield

City/Town	Westfield
Dam	Springfield Water Works Intake Dam
Name	Springfield City Water Works

WESTFIELD
D21028

SPRINGFIELD WATER WORKS DAM

D21028

NO IMAGE ON FILE FOR THIS RECORD

(INFORMATION EXISTS ONLY ON A FILE CARD FROM THE OFFICE OF THE FORMER HAMPDEN COUNTY ENGINEER.)

Stanley Park Dam aka Gillette Pond Dam fka Parker Dam

1966 Westfield

Located on Gillette Pond in Stanley Park.

Abutters	Stanley Park
City/Town	Westfield
Dam	Stanley Park Dam
Dam	Gillette Pond Dam
Dam	Parker Dam
Name	Stanley Home Products Inc.
Name	Stanley Park Trust
Water	Gillette Pond

CATHERINE L. O'BRIEN
Chairman of the Board

FOSTER E. GOODRICH
President and Director of Sales

STANHOME
A STANLEY HOME PRODUCT

Stanley Home Products, Inc.
EASTHAMPTON, MASSACHUSETTS

November 8, 1966

Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen:

Enclosed please find our print number SP-C-1935, which shows the existing dam and overflow located on Gillette Pond in Stanley Park, Westfield, Massachusetts.

Sincerely,

STANLEY HOME PRODUCTS, INC.

Donald W. Harry

Donald W. Harry
Plant Engineer

DWH/cal

ENCLOSURES

4/5/68 Plans & copy of letter
sent to Sec. W. McDonald

Stevens Paper Company Dams aka Crane's Mill Dams

1937 Westfield

Upper Mill dam located on Little River just downstream from Horton Bridge - Lower Dam located on Little River. See also: "Crane and Company Dam" - D21007. See also: County Roads Plan #21 (1955) "Lower Mill Dam - Stevens Paper Co".

Bridges	Horton Bridge
City/Town	Westfield
Dam	Stevens Paper Company Dams
Dam	Crane's Mill Dams
Name	Stevens Paper Company
Water	Little River

May 17, 1933

Stevens Paper Mills, Inc.,
Granville Road,
Westfield, Mass.

Gentlemen:

In accordance with the provisions of Section 45 of Chapter 253 of the General Laws as amended by Chapter 334 of the Acts of 1923 and as further amended by Chapter 178 of the Acts of 1924 relative to the inspection, condition and safety of the dams of Hampden County, you are notified that your dam, located on the Westfield Little River in the City of Westfield, has been inspected by our engineer and your attention is called to the following condition noted and recommendation made by him;

> "The concrete retaining wall leading downstream from the south abutment of the dam shows erosion along its surface and needs repairing."

Any further information concerning this matter which you desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By ______________________
Chairman.

____

____

ADDRESS ALL
CORRESPONDENCE TO
WINDSOR, CONN.

THE STEVENS PAPER MILLS INC.
DELAWARE CORPORATION
WESTFIELD, - MASS.

MAKERS OF
HIGH-GRADE THIN
PAPERS

May 20th, 1933

Commonwealth of Massachusetts
County of Hampden
Springfield, Mass.

Attention: Mr. Thos. [illegible]. Costello, Chairman

Gentlemen:-

In reply to your letter of May 17th, relative to the retaining wall at the lower part of our dam, we would request, if, at your convenience you could have one of your engineers call on the writer to go over the matter of the necessary repairs so that we can place this wall in condition to meet with your approval, we will then plan to go ahead with the work in the immediate future.

Yours very truly,

THE STEVENS PAPER MILLS, INC.,

R.J. West

RJW:GCM

Assistant Superintendent

May 27, 1933

Stevens Paper Mills, Inc.,
Westfield, Mass.

Mr. R. J. West, Ass't. Sup't.,

Dear Sir:

Your letter of the 20th inst. addressed to the Hampden County Commissioners regarding your dam in Westfield has been turned over to me, the engineer who inspected the dam.

In compliance with your request for a meeting at the dam, I may say that I will be at the dam on Monday next May 29th at 9 A. M.

Yours very truly,

James I. Tighe.

October 21, 1936

Mr. John J. Murphy,
Representative 15th Hampden District,
Parker Avenue,
Westfield, Mass.

Dear Sir:

The matter contained in your petition dated October 20, 1936 has been referred to William C. Giles, Counsel for the County of Hampden, and he is giving same his attention.

Very truly yours,

COUNTY COMMISSIONERS

By____________________________
Chairman.

C/N

November 4, 1936

John J. Murphy, Representative,
15th Hampden District,
Parker Avenue,
Westfield, Mass.

Dear Mr. Murphy:

Enclosed herewith is copy of report of the County Engineer relative to the Crane & Co. Inc., dam in Westfield.

Very truly yours,

CHAIRMAN, COUNTY COMMISSIONERS

TJC/N
Encl.

VIBRATION AT DAM MAY BE STOPPED

S. Repub 7/16/37

Engineers Decide Placing 'Breakers' at Crane's Dam May Stop Shaking From Falling Water

Westfield, July 15—County Engineer James L. Tighe accompanied by an assistant and C. M. Stevens, president of the Stevens Paper Company, inc., and Representative John J. Murphy held a conference this morning at Crane's dam, which is part of the Stevens company's mill works. They conferred about elimination of vibration caused by the flow of water over the dam.

Property owners in the vicinity of the dam have complained that the vibrations were damaging their property. In the fall of 1936, the county commissioners and the county engineers suggested that an "apron" be built as a means of ending the vibration. The problem has been studied during the past year and it has been ascertained that the vibration is caused by a vacuum created by the flow of water over the dam.

At the meeting this morning Mr Stevens signified his willingness to put into practice suggestions that might benefit the taxpayers in that section. The plan now under consideration is to construct "breakers"

July 7, 1937

Representative John J. Murphy,
Westfield, Massachusetts.

Dear Sir:

Your letter of June 29th has been received and we are enclosing herewith copy of a letter that we are sending to the Stevens Paper Mills Inc.

You know under the law we have no jurisdiction compelling them to put an apron on the dam. The only jurisdiction we have over the dams in the County is in regard to their safety.

Very truly yours,

COUNTY COMMISSIONERS

By____________________
Chairman.

TJC/N
Encl.

July 7, 1937

Stevens Paper Mills Inc.,
Windsor, Connecticut.

Dear Sirs:

We have received a petition from the people who live in the vicinity of your dam located in Westfield, Massachusetts complaining about the noise from the overflow.

We have had our Engineer, Mr. James L. Tighe, investigate it and find the dam in excellent condition so far as safety is concerned, which is the only jurisdiction the County Commissioners have.

However, he has suggested that if you desire to put an apron on the dam, it would avoid considerable noise.

Very truly yours,

COUNTY COMMISSIONERS

By____________________________
Chairman.

TJC/N

July 9, 1937

Mr. James L. Tighe,
189 High Street,
Holyoke, Mass.

Dear Mr. Tighe:

We enclose herewith copy of a letter received from Mr. C.N. Stevens in regard to the dam in Westfield.

We believe that it might be well for you to have a conference with Representative Murphy and Mr. Stevens and go over the matter of the dam.

We are notifying Representative Murphy to get in touch with you and you will arrange the conference at your convenience, his and Mr. Stevens.

Very truly yours,

COUNTY COMMISSIONERS

By________________________
Chairman.

TJC/N

July 9, 1937

Representative John J. Murphy,
Westfield, Massachusetts.

Dear Sir:

The County Commissioners enclose herewith copy of a letter received from Mr. C.N.Stevens in regard to the dam in Westfield.

If you desire to get in touch with Mr. James L. Tighe, the County's Engineer, he will make an appointment with Mr. Stevens and probably you can make some satisfactory arrangements about the dam.

Very truly yours,

COUNTY COMMISSIONERS

By____________________________
Chairman.

TJC/N

December 21, 1949

Stevens Paper Mills, Inc.
Westfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam located on Little River in Westfield has been inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him:

> "In a recent inspection made of the lower dam located on Little River in Westfield, a leak was noticed at the base of the easterly abutment just adjacent to the dam. The earth dike, back of the abutment on the upstream face, has slid and some settlement is apparent. There is no evidence of the earth fill being washed through the leak, however, the leak is sizable and should be investigated and the earth dike repaired."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By Thomas F. Sullivan
Chairman

Charles W. Bray

William F. Stapleton

Dec. 2, 1959

Stevens Paper Co.
Westfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your Upper Dam near Hortons Bridge on Little River, has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "The dam is in good condition. The left abutment is also in good condition. At the right abutment there will be need for some protective work, in the near future, at the downstream face of the stone masonry where erosion has now worn away the natural soil. Erosion has caused loss of soil from behind the abutment masonry at its downstream end."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

HAMPDEN COUNTY COMMISSIONERS

____

____

____

CD Westfield
Aug. 3, 1960

Stevens Paper Mills, Inc.,
Westfield, Mass.

Att: D. E. Drake, Gen. Manager

Gentlemen:

The Board of County Commissioners of Hampden County, have given me a copy of a communication sent by you in connection with certain repairs and protective work, at the right abutment of the Upper Mill Dam, near Horton Bridge on the Little River in Westfield. You have requested that at the next inspection the condition be examined and a report made to you on the work completed.

The dams in Westfield are scheduled for inspection in early Fall and, at that time, you will be notified of the results of the inspection.

Very truly yours

George H. McDonnell
County Hydraulic Engineer

GHM/cmb

Sept. 7, 1960

Stevens Paper Mills, Inc.
Westfield, Massachusetts

Att: D. E. Drake, General Manager

Gentlemen:

In reference to your communication of July 28, 1960, pertaining to repairs and protective work completed on the right abutment of your Upper Mill Dam near Horton's Bridge on Little River in Westfield, the County Hydraulic Engineer made an inspection of the dam and the repair work on Wednesday, August 31, 1960.

The County Hydraulic Engineer reports that the area at and downstream of the right abutment where the river bank had been washed, heavy riprap chinked in with smaller stone has been used to fill the area and provide a good surface to prevent further washing and scour by high rates of flow in Little River. Also, the County Hydraulic Engineer reports that riprap and broken stone have been placed upstream of the right abutment at the right river bank to fill in a washed area and protect the bank from further erosion.

As existing at the time of the inspection on August 31, 1960, the County Hydraulic Engineer reports to our Board that the condition of the dam, and particularly the right abutment, is very satisfactory.

We appreciate your cooperation in connection with this matter and your attention to repairs completed in a workmanlike and efficient manner.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

CD Westfield
August 9, 1962

Stevens Paper Mills, Inc.
77 Mill Street
Westfield, Mass.

Att: Mr. Rea, Engineering Division

Gentlemen:

This will confirm the fact that at our conference on the morning of Wednesday, August 8, 1962, at the Upper Mill relative to the proposed wall to be constructed on the left abutment of the dam, the undersigned was of the opinion that the work as contemplated does not come under County jurisdiction. The contemplated wall is to be built on the existing masonry structure of the left abutment and on the natural ground for the purpose of diverting water and debris as well as ice cakes from the Mill Building in time of extreme flood conditions. Whereas in the past, the Mill Building was subjected to the destructive force of flood water, the wall as proposed will provide protection to the Mill Building in the future during extreme flood flow conditions.

The wall as contemplated does not affect the safety of the dam and consequently, would be outside of the provisions as set forth in Chapter 253 of the General Laws.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

CD Westfield
August 9, 1962

The Hon. the Board of County Commissioners
Hampden County Court House
37 Elm Street
Springfield, Mass.

Gentlemen:

Enclosed herewith for your information and file purposes, please find a copy of a communication sent to the Engineering Division of the Stevens Paper Mills in Westfield. It is now planned by the Mill personnel to construct a masonry wall in the form of a dike at and above the left abutment of the dam at the upper Mill on Little River in Westfield. The purpose of this masonry wall dike is to divert flood flows, ice cakes, debris, etc. from being in direct contact with the Mill building. The personnel in the Engineering Division requested that I meet with them at the site of the Mill to determine whether or not the work as contemplated would come under County jurisdiction.

On viewing the site and the proposed preliminary drawings, I notified Mr. Rea of the Stevens Paper Mills, Inc. that the wall as contemplated would not affect the safety of the dam and consequently, would not come within the jurisdiction of Chapter 253 of the General Laws.

Mr. Rea requested that I submit my opinion to the Officials of the Paper Mill and I am enclosing herewith for your files and information, a copy of my letter. The contents are self-explanatory.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

CD Westfield
April 25, 1966

The Honorable the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen:

In accordance with your communication of April 21, 1966, I have reviewed a plan submitted to your Board by the Stevens Paper Mills, Inc. of Westfield, Mass. for flashboards to be installed across the crest of the dam located at the Upper Mill on Little River. The flashboards are to be held in place by 1" round iron pins located on 6 ft. centers across the crest of the dam. The pins are to be 12" in height and are to support 12" of flashboard across the dam crest.

Each flashboard pin will be strengthened thru the use of a 1/4" tie rod anchored to a 5/8" pin to be set in the masonry of the overflow dam.

I have reviewed the design and have concluded that the flashboards as proposed will not endanger the safety of the dam. The flashboards will provide an additional one foot of stored water in the pond above the dam needed by the Industry in carrying on its operations. The flashboards will go out under flood flow conditions prior to flood flow height over the dam becoming high enough to endanger adjacent property.

Provided the flashboards and pins are installed in accordance with the drawing submitted to your Board, it is recommended that your Board approve the installation of the proposed flashboards.

The flashboards as proposed are shown on a drawing 8-1/2" x 11" in size and the drawing is entitled "The Stevens Paper Mills, Inc., Westfield, Mass., Proposed Flashboards, Upper Mill Dam, Drawing #IU-242". The drawing is dated March 23, 1966.

I am returning to you one of the two copies of the drawing sent to me for my review and recommendations.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mbf

Enc.

November 16, 1966

Stevens Paper Company
77 Mill Street
Westfield, Massachusetts

Att: Engineering and Maintenance Section

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam at the lower mill in Westfield has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "The concrete crest cap was noted to be in good condition and no flashboards were on the crest. Water was flowing over the crest on the day of inspection. It was noted that water still leaks through the face of the stone masonry dam at a few places along the left one-third of the structure and near the bottom of the dam proper. This condition is not serious.
>
> At the right abutment some erosion of concrete was noted at the water flow line just near the downstream edge of the dam crest cap. The erosion is in the corner of the right abutment. This erosion is not bad enough to require repairs as yet but the condition will be observed in the future and recommendations made regarding repairs if erosion progresses much further.
>
> The stone and concrete masonry forming the left abutment adjacent to the mill was found to be okay. At the top of the embankment near the upstream edge of the earth fill near the woven wire fence, repairs are needed. Also, repairs should be made to the riprap upstream slope of the embankment in the vicinity of the woven wire fence. The remainder of the embankment and upstream slope was found to be satisfactory."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

____

____

____

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEfferson 3-3991

CD Westfield
May 18, 1970

The Honorable the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Re: Lower Dam
Stevens Paper Mill, Westfield

Gentlemen:

Attached hereto please find a copy of a letter to the Stevens Mills of Westfield and to Camp, Dresser & McKee of Boston regarding changes made and to be made at the dike situated adjacent to the lower mill in Westfield. The contents of the letters are self-explanatory.

Very truly yours,

George H. McDonnell

George H. McDonnell
County Hydraulic Engineer

GHM/amd
Encl.

Sunnyside Ranch Dam

1942 Westfield

Proposed interested in dam.

Abutters	Sunnyside Ranch
City/Town	Westfield
Dam	Sunnyside Ranch Dam
Name	Hall, Philip K
Name	H P Hall & Sons

H. PETER HALL HERBERT W. HALL PHILLIP K. HALL

DEALERS IN
FARM MACHINERY AND
EQUIPMENT

SUNNYSIDE RANCH
H. P. HALL & SONS
TELEPHONE 1566-M

BREEDERS OF
PUREBRED HOLSTEIN CATTLE
HIGH PRODUCTION AND FAT

POST OFFICE BOX 305
WESTFIELD, MASS.

March 24, 1942.

County Commissioners,
Hampden County,
Springfield, Mass.

Gentlemen:-

Will you kindly advise me of the regulations regarding damming brooks on private property.

We have a small brook on our property, which at one time had a dam across it but has been washed out, and we would like to replace it.

Thanking you for your attention, I am,

Yours very truly,

Philip K. Hall

Philip K. Hall.

PKH/ARH

March 28, 1942

Philip K. Hall,
Post Office Box 305,
Westfield, Mass.

Dear Sir:

In reply to your letter of March 24th, relative to replacing a dam across a brook on your property, we wish to state that plans and specifications of your proposed dam must be filed in the County Commissioners' office if the proposed dam exceeds any of the following dimensions:

> If the area draining into the pond formed thereby exceeds one square mile,
>
> If the dam is more than ten feet in height above the natural bed of the stream at any point,
>
> If the quantity of water which the dam impounds exceeds one million gallons.

Very truly yours,

COUNTY COMMISSIONERS

By ______________________________
Chairman.

C/N

Tekoa Dam

- Westfield

Also *See* Dam Report Section: Westfield

City/Town	Westfield
Dam	Tekoa Dam

WESTFIELD
D21032

TEKOA DAM

D21032

NO IMAGE ON FILE FOR THIS RECORD

(INFORMATION EXISTS ONLY ON A FILE CARD FROM THE OFFICE OF THE FORMER HAMPDEN COUNTY ENGINEER.)

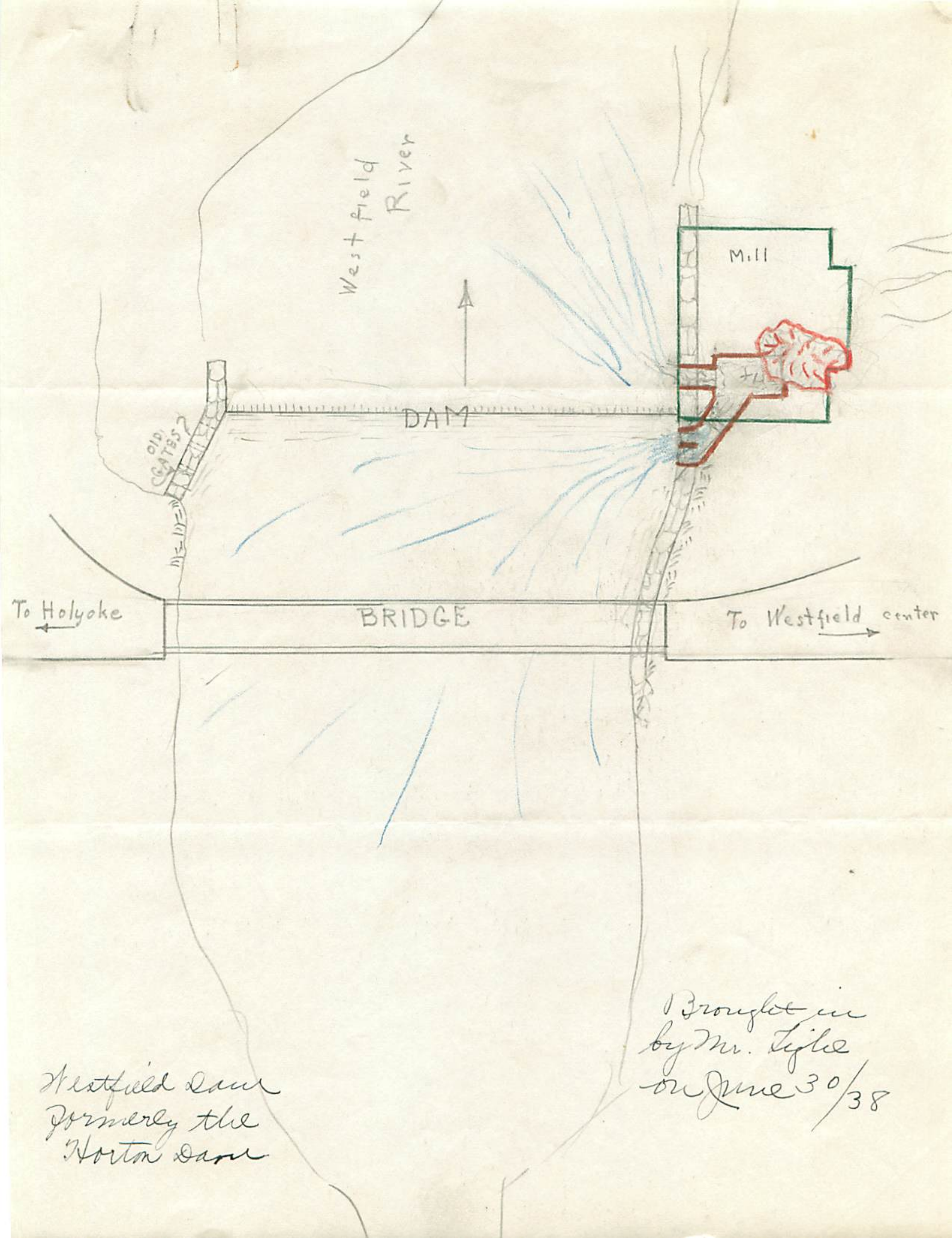
Turner Falls Power & Electric Company Dam aka Westfield Dam fka Horton Dam aka Great River Dam aka Horton Dam

1938 Westfield

Dam located on Westfield River at a point just below the Elm Street Bridge.

Abutters	Great River Mills
Abutters	Allen Mills
Bridges	Elm Street Bridge
City/Town	Westfield
Dam	Westfield Dam
Dam	Horton Dam
Dam	Turner Falls Power & Electric Company Dam
Name	Bush, Charles
Name	Quinnehtuk Company
Name	Bush, Walter
Name	Westfield Manufacturing Company
Name	Phelps
Name	Bush, Henry
Name	Collins, Polly
Name	Bush, Enoch
Name	Bush, Oliver
Name	Turners Falls Power & Electric Company
Name	Horton, Samuel

Name	Noble, Horace
Railroads	New Haven & Northampton Railroad Company
Streets	Shepard Street
Water	Westfield River
Water	Great River



Westfield Dam
formerly the
Horton Dam

Brought in
by Mr. Tyle
on June 30/38

DEED FROM PHELPS TO WESTFIELD MANUFACTURING COMPANY

An undivided moiety of land conveyed by Horace Noble to said Phelps by his deed bearing date July 28th 1813 and also an undivided moiety of land conveyed by Enoch Bush, Oliver Bush, Walter Bush, Charles Bush, Henry Bush and Polly Collins by their deed bearing date Aug. 4th 1813 the former piece of land lying on the south side of the Great River and the latter on the north side of said River in Westfield aforesaid & is to be holden by the said Westfield Manufacturing Company and their successors and the said Phelps his heirs & assigns as Tenants in Common with the Conditions and limitations herein after expressed vis the said Westfield Manufacturing Company and their Successors and the said Phelps his Heirs & Assigns are to be at equal expense in building and supporting a dam across the River upon the falls of the said premises and to share equal privileges and particularly each one is to be entitled to half of the water that the River may afford and the said Westfield Manufacturing Company their successors may improve their half of the water either in the Canal or from the flow or the dam on the River or at both places. It is however agreed that the said Philips his heirs and assigns shall build a gristmille and support the same in case the town of Westfield shall require it on account of the Ford way being flowed, And that the said Phelps his Heirs & Assigns shall never erect any other mill except a Sawmill or on any other business upon the premises that may be to the injury of the Westfield Manufacturing Company or their Successors in any branch of business that they may have previously commenced in Westfield. And it is also agreed that the said Westfield Manufacturing Company and their successors shall never erect any Gristmill or saw mill upon the premises & Neither party shall ever erect any powder mill on the premises.

WESTFIELD TOWN MEETING May 13th 1879

Article 3

VOTED: That the town cause all trees and brush growing upon the tract of land called Town Island lying between the old Pochassic road and the extreme south bank of Westfield Great River to be cut down and removed and all the logs, driftwood, and other obstructions lying upon the surface of said tract to be removed and carried away and a channel one hundred and fifty feet wide to be excavated across wide to be excavated across the northerly part of the Island as low as low water below the old fordway or as low as any ledge which may be encountered if any before that depth to be reached any the material excavated be removed to or beyond the dike, and this state of things hereafter be maintained.

VOTED: That the town purchase said tract called the town Island and lying between the old Pochassic Road and extreme south bank of said river provided the same can be purchased at a reasonable price.

VOTED: That the town cause to be cut down and removed all trees and brush growing upon and between the banks of said river below the Island considered obstructions and between Hortons Dam.

VOTED: That the town cause all trees and brush growing upon the banks of said river within the limits of the town through the gorge at Morley's bridge, to be cut down and carried away and the bank of said river through said Gorge within the town to be hereafter kept clear of all trees and brush.

Article 6. M.B. Whiting moved the adoption of the majority report of the flood committee, L. F. Thayer moved to amend to lengthen dam thirty feet to the south and lowering it three feet with flash boards.

F. S. Egleston moved as a substitute that Horton's dam be entirely removed.

The substitute of F. S. Egleston to remove the dam entirely was rejected. The amendment of L. F. Thayer to lengthen dam thirty feet to the south and lowering it three feet with flash boards was lost on motion of M. B. Whitney it was

VOTED: That the town extend Horton's dam at Great River Mills in this town at its southerly end eighty feet in addition to and at a uniform height with the present dam provided the New Haven and Northampton Company shall raise its railroad bridge over said river one foot at its southerly end without expense to the town. It was also

VOTED: That the town remove and take away and appropriate to its own use all or any part of the earth gravel stone walls or other materials lying upon the southerly side of said river easterly of Elm Street in this town and any building thereon standing for the purpose of securing the free and unobstructed flow of water of said river over Horton's dam as the same may be lengthened and

A motion to reconsider the vote when the town voted to extend Horton's Dam at Great River Mills in this town at its southerly end eighty feet in addition to and at uniform height with the present dam was made and the vote being taken the same was refused.

Voted to locate and construct a new dyke in substantially the same place as the present one except at the upper end where some deviation may be described - built of suitable material properly laid in water fourteen (14) feet wide at least on top with proper slopes and when completed and settled to be at the point of intersection with the railroad of the New Haven and Northampton Railroad on a level with the top of the road bed as it shall then exist and a corresponding height throughout its whole length above high water at the time of the last flood.

Voted to construct a new dyke commencing at the southerly end of the new dam ordered to be built and running westerly in a straight line to the intersection of the Old Dyke at Shepard Street as shown on the map.

At meeting of May 17, 1879, this last vote was reconsidered and lost.

The next preceeding vote was voted over again.

Voted L. F. Root, L. F. Thayer, E. C. Carpenter, David Lamberton, Hiram Fowler and A. J. Grocia committee to carry out all votes.

TOWN MEETING July 5, 1879

Ratified all above votes.

VOTED: To locate and construct a new dyke in substantially the same place as the present one except at the upper end where some deviation may be desirable, built of suitable materials properly laid in water, fourteen feet wide at top with proper slopes and when completed and settled to be at the point of intersecting with the railroad of the New Haven & Northampton Company on a level with the top of the roadbed as it shall-then exist and of a corresponding height throughout its whole length above high water at the time of last flood.

BOSTON
GREENFIELD

TURNERS FALLS

SPRINGFIELD
MONTAGUE CITY

TURNERS FALLS POWER & ELECTRIC CO.

CONSTITUENT OF WESTERN MASSACHUSETTS COMPANIES

ADDRESS REPLY TO

Turners Falls, Mass.,
Nov. 22, 1937.

Ref. #1502

Hampden County Commissioners
Court House
Springfield, Massachusetts

Gentlemen:

We are aware of the condition of our dam across the Westfield River in Westfield, called to our attention in your letter of Nov. 3rd.

We have no present intentions of repairing or further maintaining this particular dam, as we find the cost of adequate maintenance to be more than the output is worth.

With this information in mind, do you care to make any further recommendations and is it within your province to make any positive orders in the matter, either looking to maintenance or to removal.

Your communication was addressed to the Quinnehtuk Company but the dam is now owned by the Turners Falls Power & Electric Co.

Yours very truly,

TURNERS FALLS POWER & ELECTRIC CO.

C F Mosher

C. F. Mosher
General Superintendent

CFM-KDK

copy of this letter sent to Mr. Tighe on Nov. 23/37

COPY

Ref. #1502

Turners Falls, Mass.,
July 11, 1938.

Mr. Ralph W. Crowell, Attorney
1200 Main Street
Springfield, Massachusetts

Dear Sir:

In connection with the matter of title to the Allen Mill property in Westfield, about which I phoned you this morning, the following extract from a special committee report to the Town of Westfield and taken from the town report of Feb. 1, 1880, is of interest.

> "One of our first duties was to make some arrangement with Mr. Samuel Horton, in the matter of damages from the taking of land, buildings and power on the south side of the river. We agreed with Mr. Horton to leave the matter to the arbitration of Messrs. Couch, Tucker and Gilbert, three gentlemen of experience in such matters. Their award made July 9th, was, that the town of Westfield should pay to Mr. Horton $2500, and build for him a fore-bay and wheel-pit, Mr. Horton to furnish the penstock or iron tube connecting the same. Some differences of opinion having arisen in regard to the matter of Mr. Horton's accepting the award, work on the fore-bay and wheel-pit was delayed till some time in September, when settlement was made, and the work of putting in the extra work was pushed as fast as possible. In doing this extra work, your Committee felt that the future prosperity of the town demanded that the water-power should be developed to its greatest advantage, and that in the near future its development will pay the extra cost. We have certainly provided for one of the best water-powers in Western Massachusetts, and sooner or later the town must and will receive great benefit therefrom."

It is evident from this report and from certain information in the City Engineer's office that a satisfactory arrangement was consummated and it is also evident that the Town built a heavy retaining wall below the dam, which at the present time supports a substantial brick building owned by us.

The question at issue now or which may be at issue,- Which party has the obligation to maintain the retaining wall; for unless this wall is maintained the City dike system to the east is of no value as flood protection.

It is for this reason that I have asked you to search the records again to see if there are any recorded transactions between Horton and the town which will have a bearing on this subject.

Yours very truly,

TURNERS FALLS POWER & ELECTRIC COMPANY

C. F. Mosher
General Superintendent

CFM-KDK
CC.-P.B.R.S.

C O P Y

RALPH W. CROWELL
Attorney at Law
1200 Main Street
Springfield, Mass.

July 13, 1938

Turners Falls Power & Electric Company
Turners Falls
Massachusetts

Attention: Mr. Mosher

Gentlemen:

In reference to the dike in Westfield I have gone over our record of the search of the title which we made in 1930 and also have checked to a certain extent in the Registry to find any agreement on record in the Registry of Deeds in respect to any duty concerning the dike. I find no such record.

There is a deed in the chain of title from one Phelps to the Westfield Manufacturing Company in which there is mention of both parties to the deed being at equal expense in building and supporting a dam across the river, and further there is a statement to the effect that said Phelps, his heirs and assigns, shall build a gristmill and support the same in case the Town of Westfield shall require it on account of the fordway being flowed. I doubt very much if this refers to the present dike but I have not as yet been absolutely able to determine where the fordway is. Furthermore I doubt if this would give the Town any rights against you in respect to the present dike.

In addition there are certain votes of the Town of Westfield in reference to this matter. I am enclosing a copy of the Phelps deed and the records of the Westfield town meeting in 1879 in respect to the dam over the river at the point where we are interested. The town in passing these votes evidently acted under the provisions of Chapter 249 of the Acts of 1879. This act was passed on April 22 and the town acted upon May 13 of the same year.

I do not know whether these papers will help you or not but certainly we have not found any document relating to any definite obligation of a predecessor in title to support or maintain the dike at or near your building on the river. I shall continue to see if I can find anything but for the past few days have been tied up almost continuously by the dike cases against the United Electric Light Company.

I doubt very much if there is any other paper on record either at the Registry or in the Town records relating to the obligation of any owner of land to maintain a dike along the river.

Very truly yours,

(Signed) Ralph W. Crowell

RWC:DHP

MEMBER
AM. SOC. C. E.
INST. C. E. GREAT BRITAIN
ENG. INST. OF CANADA

JAMES L. TIGHE
CONSULTING ENGINEER
CALEDONIAN BUILDING, 189 HIGH STREET
HOLYOKE, MASS.
TELEPHONE 5525
MEMBER AM. INST. OF CONSULTING ENGINEERS, INC.

MEMBER
BOSTON SOC. C. E.
ENG. SOC. WEST. MASS.
AM. & N. E. W. W. ASSOC'S

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
ANALYSIS OF WATER

WATER POWER INVESTIGATIONS
AND DEVELOPMENT
DAMS AND POWER INSTALLATIONS
ESTIMATES AND APPRAISALS

July 19,1938

The Hon. The Board of County Commissioners
Hampden County, Court House
Springfield, Massachusetts

Thomas J. Costello, Chairman,

Dear Sir:

In compliance with your request, I have examined the dam of the Turners Falls Power and Electric Company in Westfield and report as follows:

This dam is located on the Westfield River, at a point just below the Elm Street Bridge in Westfield, where the drainage area of the river is three hundred and sixty-five square miles. It is a timber spillway structure about four hundred and seventy-five feet in length and seven feet in height. The greater part of the dam rests upon a rock ledge which extends across the river bed from the North bank to within some fourty feet of the South bank of the river. At this point the ledge drops away very sharply, and the remaining length of the dam is founded on wood piles driven into the sand and gravel foundation. For a length of eighty feet from the South end, the dam was provided with an inclined wooden apron to protect the toe of the dam from erosion.

At each end of the dam is a heavy stone abutment wall extending to a height of some fifteen feet above the crest of the dam. The mill building attached is located very close to the South end of the dam, and indeed, one of the brick walls of the mill is laid directly on the South abutment wall of the dam. The forebays, penstocks, and water wheel pits are located in the cellar of the mill building. Like the South end of the dam adjoining, the South abutment wall and, also, at least a portion of the mill building, are built upon wood piles driven into the sand and gravel foundation.

On June 28th last, during the high water resulting from a continual heavy rainfall, water from the river apparently worked its way into and under the mill building, undermining a part of its foundation with the result that a section of the exterior wall farthest from the river, and also a portion of the interior of the mill building collapsed.

The damage caused by the washout was confined entirely to the mill building, and to the extreme southerly end of the dam. The main portion of the dam remained intact and apparently sustained little or no material damage. Within a few days after the partial collapse of the mill building, the owner removed a section about 100 feet in length in the middle of the dam, thus drawing down the pond and making a free passage for the flow of the river.

As the conditions exist at the present time, the chief concern is not that the dam itself may give out even under a severe flood, for this particular type of inclined timber deck dam seldom fails suddenly but rather disintegrates very slowly, piece by piece, over a period of time. The main problem has to do with the possibility of further damage being done by the washout which already exists under the mill building, especially in the event of high water in the river.

In the case of high water, there is, of course, the possibility of the present breach under the mill being enlarged and perhaps causing water to accumulate in the low lying diked district bordering the South side of the river. On the other hand, it is not probable that this will occur, since the river level has been lowered some seven feet by the removal of a section of the dam.

At the present time the owner of the property is taking down the mill building, and until this work is completed, little can be done toward investigating the conditions and planning suitable means of repairing the damage and making the site secure and safe for the future.

It is believed that the owner does not intend to maintain the present dam, but what plans are being made for the future of the property is not known.

Inasmuch as the pond has been drawn down and there does not seem to be any great immediate danger involved, it would seem that the County could defer any action for a short time until more information is available on the matter, or until those in charge of and responsible for the structures involved have made known what is proposed to be done for the future. Because of the nature of the Westfield River, however, which is noted for its sudden and violent floods, it is evident that some action must be taken within a few weeks to make this location safe and secure against possible Fall floods.

Respectfully submitted,
James L. Tighe,
By Frank A. Doyle
Assistant Engineer

Rec'd 7/25/38

City of Westfield, Massachusetts

Board of Public Works

GLENN B. COWLES, CHAIRMAN
JOHN O. McKEAN
PATRICK J. MAHONY

OREN E. PARKS, SUPT.

July 23, 1938.

Thomas J. Costello, Chairman,
Board of County Commissioners,
Court House,
Springfield, Massachusetts.

Dear Sir:-

I wish to thank you for the copy of report under date of July 19, 1938 of Frank A. Doyle, Assistant Engineer to James L. Tighe, on his examination of the dam of the Turners Falls Power & Electric Company in Westfield.

I inclose herewith copy of letter of Charles F. Mosher, General Superintendent, of Turners Falls Power & Electric Company under date of July 11, 1938 to Mr. Ralph W. Crowell, Attorney for said company, and copy of Mr. Crowell's reply to Mr. Mosher under date of July 13, 1938, all with reference to title of the Allen Mill property in Westfield which is now owned by the Turners Falls Power & Electric Company.

Very truly yours,
Oren E. Parks
Oren E. Parks,
Superintendent.

OEP:S
Inc.

Turners Falls,
Power + Electric Co.

November 3, 1937

Quinnehtuk Company
c/o Western Mass. E. Co.
Greenfield, Mass.

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby notified that your dam on Westfield River in Westfield has been inspected by our engineer and your attention is called to the following conditions noted and recommendations made by him;

> "At a point about a hundred feet from the North abutment of this timber crib dam, a length of some twenty feet of the crest is broken down to a depth of a foot or more. Besides the inclined apron protecting the southerly end of the dam, which rests on a gravel foundation at this point, is almost entirely broken up and washed away. It is recommended that these conditions, and the need of repairs to the structure, be brought to the attention of the owner."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By________________
Chairman

____

____

COPY

GENERAL LAWS (Ter. Ed.)
Chapter 253.

Section 46.

If, upon examination, the structure is not, in the judgment of the commissioners, sufficiently strong to resist the action of the water under any circumstances which may reasonably be expected to occur, they shall, with the advice of an engineer, determine and direct what alterations or repairs are required to make the structure permanent and secure, and shall in writing order the owners thereof to make such alterations or repairs within a reasonable time and the results of such examination and the orders thereon shall be duly recorded by said commissioners.

Section 47.

If, after notice in writing to the owner of a reservoir or dam which has been so examined and adjudged to be unsafe, the said owner refuses or neglects to make such alterations or repairs as the commissioners order, they may, at the expense of the county, cause such reservoir or dam to be altered and repaired or any part thereof removed or the water drawn off, whichever they may consider necessary for the safety of life, property, roads or bridges on the stream below. After such removal, no structure shall be erected except in compliance with the three preceding sections, and after the water has been drawn off, the reservoir shall not be filled again until the orders of the commissioners have been complied with.

Section 48.

The commissioners shall make such orders as they may deem just as to the payment by the owner, county or other party or the costs and expenses incurred by them under the three preceding sections, and if the reservoir or dam was adjudged to be unsafe, said costs and expenses may be ordered paid by the owner, with interest, from the time they were paid by the county. Notice shall be given the county treasurer and the owner or other party of the amount due the county.

Section 49.

No order, approval, request or advice of the county commissioners shall impair the legal duties and obligations of the owners, of reservoirs, reservoir dams or mill dams or their liability for the consequences of their illegal acts or of the neglect or mismanagement of their servants or agents.

JAMES L. TIGHE

CONSULTING ENGINEER

HOLYOKE, MASS.

Copy

July 19, 1938

The Hon. The Board of County Commissioners
Hampden County, Court House
Springfield, Massachusetts

Thomas J. Costello, Chairman,

Dear Sir:

In compliance with your request, I have examined the dam of the Turners Falls Power and Electric Company in Westfield and report as follows:

This dam is located on the Westfield River, at a point just below the Elm Street Bridge in Westfield, where the drainage area of the river is three hundred and sixty-five square miles. It is a timber spillway structure about four hundred and seventy-five feet in length and seven feet in height. The greater part of the dam rests upon a rock ledge which extends across the river bed from the North bank to within some fourty feet of the South bank of the river. At this point the ledge drops away very sharply, and the remaining length of the dam is founded on wood piles driven into the sand and gravel foundation. For a length of eighty feet from the South end, the dam was provided with an inclined wooden apron to protect the toe of the dam from erosion.

At each end of the dam is a heavy stone abutment wall extending to a height of some fifteen feet above the crest of the dam. The mill building attached is located very close to the South end of the dam, and indeed, one of the brick walls of the mill is laid directly on the South abutment wall of the dam. The forebays, penstocks, and water wheel pits are located in the cellar of the mill building. Like the South end of the dam adjoining, the South abutment wall and, also, at least a portion of the mill building, are built upon wood piles driven into the sand and gravel foundation.

On June 28th last, during the high water resulting from a continual heavy rainfall, water from the river apparently worked its way into and under the mill building, undermining a part of its foundation with the result that a section of the exterior wall farthest from the river, and also a portion of the interior of the mill building collapsed.

The damage caused by the washout was confined entirely to the mill building, and to the extreme southerly end of the dam. The main portion of the dam remained intact and apparently sustained little or no material damage. Within a few days after the partial collapse of the mill building, the owner removed a section about 100 feet in length in the middle of the dam, thus drawing down the pond and making a free passage for the flow of the river.

As the conditions exist at the present time, the chief concern is not that the dam itself may give out even under a severe flood, for this particular type of inclined timber deck dam seldom fails suddenly but rather disintegrates very slowly, piece by piece, over a period of time. The main problem has to do with the possibility of further damage being done by the washout which already exists under the mill building, especially in the event of high water in the river.

In the case of high water, there is, of course, the possibility of the present breach under the mill being enlarged and perhaps causing water to accumulate in the low lying diked district bordering the South side of the river. On the other hand, it is not probable that this will occur, since the river level has been lowered some seven feet by the removal of a section of the dam.

At the present time the owner of the property is taking down the mill building, and until this work is completed, little can be done toward investigating the conditions and planning suitable means of repairing the damage and making the site secure and safe for the future.

It is believed that the owner does not intend to maintain the present dam, but what plans are being made for the future of the property is not known.

Inasmuch as the pond has been drawn down and there does not seem to be any great immediate danger involved, it would seem that the County could defer any action for a short time until more information is available on the matter, or until those in charge of and responsible for the structures involved have made known what is proposed to be done for the future.

Because of the nature of the Westfield River, however, which is noted for its sudden and violent floods, it is evident that some action must be taken within a few weeks to make this location safe and secure against possible Fall floods.

Respectfully submitted,
James L. Tighe,

By Frank A. Doyle
Assistant Engineer

West Parish Filter Dam No 1

- **Westfield**

Also see: Dam Report Section - Westfield.

City/Town	Westfield
Dam	West Parish Filter Dam No 1
Name	Springfield City Water Works

WESTFIELD
D21034

WEST PARISH FILTER DAM #1

D21034

NO IMAGE ON FILE FOR THIS RECORD

(INFORMATION EXISTS ONLY ON A FILE CARD FROM THE OFFICE OF THE FORMER HAMPDEN COUNTY ENGINEER.)

West Parish Filter Dam No 2

- Westfield

Also see: Dam Report Section - Westfield.

City/Town	Westfield
Dam	West Parish Filter Dam No 2

WESTFIELD
D21035

WEST PARISH FILTER DAM #2

D21035

NO IMAGE ON FILE FOR THIS RECORD

(INFORMATION EXISTS ONLY ON A FILE CARD FROM THE OFFICE OF THE FORMER HAMPDEN COUNTY ENGINEER.)

West Parish Filter Dam No 3

- Westfield

Also see: Dam Report Section - Westfield.

City/Town	Westfield
Dam	West Parish Filter Dam No 3

WESTFIELD
D21036

WEST PARISH FILTER DAM #3

D21036

NO IMAGE ON FILE FOR THIS RECORD

(INFORMATION EXISTS ONLY ON A FILE CARD FROM THE OFFICE OF THE FORMER HAMPDEN COUNTY ENGINEER.)

Westfield Girl Scouts Dam

1950 Westfield

Small dam situated on Munn Brook just west of 363 Loomis Street.

City/Town	Westfield
Dam	Westfield Girl Scouts Dam
Name	Westfield Girl Scouts
Name	Uber, J J
Name	Gaylord, Richard N
Streets	Loomis Street
Water	Munn Brook

November 1, 1950

Westfield Girl Scouts
c/o Mrs. J. J. Uber
19 Pleasant Street
Westfield, Mass.

Dear Madam:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam located on Munn Brook in Westfield has been recently inspected by our Engineer, and your attention is called to the following conditions noted and recommendations made by him:

> "When flashboards are in place and the water level of the pond raised, some water flows around the northwesterly end of the dam. Sand bags and rip rap, together with a baffle plate, have been placed on the end of the dam to protect the natural sand embankment from being washed. Additional protection to keep the sand from being washed away from the roots of trees in the embankment seems advisable. Rip rap or cloth bags filled with a dry sand-cement mixture and then laid in place and wet down, would provide good protection. There is little danger of losing the pond and then only at a time of high stream flow when the flashboards are in place. A washout around the dam would not damage persons and property downstream, since the pond formed is small and the dam low, but once washed out, the cost for repairs might be quite high. This condition should be called to the attention of the Owner so that action may be taken if they so desire."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

COUNTY COMMISSIONERS

By ______________________
Chairman

____

____

June 27, 1951

Westfield Girl Scouts
c/o Mrs. J. J. Uber
19 Pleasant Street
Westfield, Mass.

Dear Madam:

In accordance with the provisions of Chapter 253, Section 45 et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam located on Munn Brook in Westfield has been recently inspected by our Engineer, and your attention is called to the following conditions noted and recommendations made by him:

> "The northwesterly end of the dam should be built up with either rip rap or masonry to prevent water washing around the end of the dam. Loss of the dam would cause no damage downstream since the pond is very small, however, repairs to the northwesterly abutment end made at this time will, undoubtedly, be much less expensive than repairs which may be required following a washout of this section of the dam. This condition is again called to the attention of the owners so that corrective action may be taken if they so desire."

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

COUNTY COMMISSIONERS

By ________________________
Chairman

____

____

Dec. 2, 1959

Richard N. Gaylord
Loomis Road
Westfield, Mass.

Dear Sir:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition, and safety of the dams of Hampden County, you are hereby advised that your small dam situated on Munn Brook just to the west of your home on Loomis Road and formerly listed in our records as the Girl Scout Dam, has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "This dam is now apparently owned by R. N. Gaylord. The dam consists of vertical steel members extending up from the bed of the brook and these members form guides to receive stop planks. At the time of the last inspection most of the stop planks had been removed and the brook flowed freely thru the site of the dam. The left abutment area has been washed thru and a wide breach exists in the natural earth. A proper abutment should be built at this point if the dam is to be reactivated. Plans and specifications of the proposed construction should be filed for review and approval.
>
> The right abutment area has had stop logs permanently placed and held in place with earth fill and concreted riprap. This right abutment is poorly designed and built."

Before the dam is reactivated you should contact the County Hydraulic Engineer, George H. McDonnell at Holyoke, JEfferson 3-3991 for a discussion pertaining to the dam in question and the proper procedure for repairing the abutment area.

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,
HAMPDEN COUNTY COMMISSIONERS

CD Westfield
Aug. 5, 1960

Mr. Richard N. Gaylord
363 Loomis Street
Westfield, Mass.

Dear Mr. Gaylord:

Reference is made to your recent communication and to my telephone call to you, in connectiom with your request that you be allowed to install flashboards across Munn Brook, at the site of your property in Westfield.

For your information and file, I am enclosing an extract from the General Laws, Chapt. 253, Sections 44 thru 50 inclusive.

You will note in the first paragraph, Section 44, that dams coming within the Law, shall not be constructed or materially altered until plans and specifications of the proposed work have been filed with and approved by the County Commissioners, of the County where it is situated. Dams that have been found unsatisfactory and in need of repairs to meet good hydraulic and structural standards, should not be activated or repaired until the repairs, as proposed, are shown on plans and specifications that are filed with and approved by the County Commissioners.

You will also note in Section 44, that the six(6) sections having to do with dams, apply to dams that fall within any one of three categories, one of which has to do with the drainage area. Wherever the drainage area is equal to or greater than one square mile, the dam is considered to be under County jurisdiction by the State Law.

Whereas the small dam on Munn Brook at your property stores a negligible quantity of water, the structure is in such a state that if flashboards and stoplogs are in place, in time of major storm runoffs, the channel of the stream might be diverted to the left or right of the abutment areas and thus do damage to adjacent natural soil on either or both banks. Abutment construction should be greatly improved before the dam is activated again.

If you wish to operate the dam each summer season, it would be necessary for you to plan proper abutment area repairs and to file plans and specifications of the proposed construction with the County Commissioners.

The undersigned would be pleased to advise you in connection with this matter. Please do not hesitate to call upon us if I can be of any assistance to you.

Very truly yours

George H. McDonnell
County Hydraulic Engineer

Nov. 30, 1960

Richard N. Gaylord
Loomis Road
Westfield, Mass.

Dear Sir:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your small dam situated on Munn Brook just to the west of your home on Loomis Road and formerly listed in our records as the Girl Scout Dam, has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "This dam is in the same general condition as reported a year ago. The left abutment area is washed out. Some stop logs are still in place within the limits of the bed of the stream. Stop logs in the central section of the dam have been removed to allow for passage of the flow of the stream. If the dam is to be maintained as an active structure, it should be repaired, and placed in good condition in accordance with plans and specifications filed with your Board."

The dam as existing and as in use in recent years does not constitute any great danger to persons and property downstream. However, in strict accordance with Chapter 253 of the General Laws of Massachusetts, the structure does come under County jurisdiction and should be a safe dam. As now existing, the structure can be washed out around the left end, and under certain conditions, around the right end. Since you own the right end, damage to property would not result in any legal action brought against you. However, damage around the left end would apparently occur to property not owned by you. Consequently, maintenance and operation of a dam on Munn Brook should only be done if the dam meets good engineering and hydraulic requirements.

If you wish to continue to operate this small dam on Munn Brook, it would be well to discuss the matter with the County Hydraulic Engineer and receive his advice as to how improvements should be made to the left abutment to prevent any possibility of washing out of the abutment area and resulting damage to property adjacent to and downstream of the structure.

The advice and assistance of the County Hydraulic Engineer will be made available to you by this Board as a service of Hampden County.

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

____

____

____

363 Loomis St.
Westfield, Mass.
July 25, 1960

Mr. George H. McDonnell
County Hydraulic Engineer
Holyoke, Mass.

Dear Sir:

I have a letter dated Dec. 2, 1959 from the Hampden County Commissioners in regard to a small dam at 363 Loomis St., Westfield.

At the time, I did not contact you as I thought this dam was not worth the bother and expense to repair. Since I received the letter no planks have been put back as requested.

However, the former pond is missed by the neighborhood children who used it for a paddling pond. Another reason that I did nothing about the dam was, I do not own the land the other side of the dam. The owner gave me verbal permission only.

This dam has been here for many years, having been built by the Girl Scouts. When activated, I had approximately four feet of planks in the dam. May I have your permission to put in half of this or about two feet, just to hold back a little water for appearance and for the kids to wade in?

Very truly yours,

Richard N Gaylord

Richard N. Gaylord

Westfield City Parks Dams fka Cunningham Dams

1933 Westfield

Four Dams Located on Pond Brook.

City/Town	Westfield
Dam	Westfield City Parks Dams
Dam	Cunningham Dam No 2
Dam	Cunningham Dam No 1
Dam	Cunningham Dam No 3
Dam	Cunningham Dam No 4
Name	Westfield City Parks
Name	Booth & Company Inc
Name	Cunningham, William
Water	Pond Brook

May 17, 1933.

Mr. William Cunningham,
Booth & Company, Inc.,
57 Beekman Street,
New York, N. Y.

Dear Sir:

In accordance with the provisions of Section 45 of Chapter 253 of the General Laws as amended by Chapter 334 of the Acts of 1923 and as further amended by Chapter 178 of the Acts of 1924 relative to the inspection, condition and safety of the dams of Hampden County, you are notified that your four dams, located on Pond Brook, so called, in the City of Westfield, Mass., have been inspected by our engineer and your attention is called to the following conditions noted and recommendations made by him;

"The dams are arranged below in the order of their proximity to the mouth of the brook, dam No. 1 being the farthest downstream.

Dam No. 1 - "The spillway of this dam was lowered some time ago, so that no pondage is now formed by it. In its present condition the dam is entirely safe."

Dam No. 2 - "The east abutment of this dam, especially that part downstream from the crest, is in poor condition and in danger of collapsing. This abutment should be repaired and made stable."

May 17, 1933

Booth & Company, Inc.,

Dam No. 3 - "There are several low places in the top of the embankment of this dam. It is recommended that these low places be filled in and the top of the embankment leveled up. There is considerable brush and debris growing or lodged in the approach to the overflow which should be cut down and cleaned out."

Dam No. 4 - "This dam is in poor condition especially around the overflow where there is considerable leakage. If the pond (Horse Pond, so called) is to be maintained at its present level, the dam should be thoroughly overhauled and the overflow rebuilt."

Now, therefore, in accordance with Section 46 of said Chapter 253, it is ordered that the above recommendations be complied with in a reasonable length of time.

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Yours very truly,

COUNTY COMMISSIONERS

By ____________________
Chairman.

____

____

May 31, 1933

Mr. William Cunningham,
241 Westchester Ave.,
Mount Vernon, N. Y.

Dear Sir:

In reply to your letter of May 20th inquiring as to the advisability of opening up your dams in Westfield and allowing the brook to flow unobstructed, we may state that the County has no objection to this procedure.

Yours very truly,

COUNTY COMMISSIONERS

By ________________________
Chairman.

____

____

Oakwood 7247
~~HILLCREST 1290~~

copy of this letter
sent to Mr Tighe on 6/9/33

241 WESTCHESTER AVE.
MOUNT VERNON, N. Y.

4th June 1933

County Commissioners
County of Hampden
Springfield Mass.

Gentn

I am obleged for yours of 31st May.

It has been suggested to me that sudden opening of the dams may cause a flood.

It seems, therefore, to me, that the logical process is to allow these dams to disintegrate gradually.

I shall be glad to have your opinion of that.

Yours truly W. Cunningham

Westfield River Realty Trust Dam

1926 Westfield

Dam located on Westfield River.

City/Town	Westfield
Dam	Westfield River Realty Trust Dam
Name	Agan, A J
Name	Westfield River Realty Trust Company
Water	Westfield River

TELEPHONE CONNECTION

A. J. AGAN
REAL ESTATE
ALL FORMS OF INSURANCE
COOLEY BROS. BUILDING
WESTFIELD, MASS.

September 17, 1926.

Office of County Commissioner
County of Hampden
Springfield, Mass.

Gentlemen:

The writer has just taken over the active management of the Westfield River Realty Trust property situated on the Westfield River Westfield, Mass. I have handed me your letter of February 17, 1926 relative to the repair on the apron on the South end of the dam owned by the above referred to company.

We have tended to the planking of this apron as suggested as far as we know how, and trust if you see fit to make another inspection you will find it all in order.

Yours very truly,
WESTFIELD RIVER REALTY TRUST
BY AJAgan Agent

AJA/B

Page 78 of report

Lewis Saffer, Manager,
Westfield River Realty Trust,
Westfield, Mass.

you are notified that your dam, located on the Westfield River so called in the City of Westfield, etc.

> "For a distance of eighty feet from the south end, the dam has an inclined apron attached. This apron was added in order to protect the penstocks from ice and the toe of the dam from erosion. The dam is not a very old structure being built about twenty-five years ago. It is in fair condition, except the apron already mentioned, which requires some repairs in the way of planking, etc."

Now, therefore, etc.

February 17, 1926

Lewis Saffer, Manager,
Westfield River Realty Trust,
Westfield, Mass.

Dear Sir:

In accordance with the provisions of Section 45 of Chapter 253 of the General Laws as amended by Chapter 334 of the Acts of 1923 and a s further amended by Chapter 178 of the Acts of 1924 relative to the inspection, condition and safety of the dams of Hampden County, you are notified that your dam, located on the Westfield River, so-called, in the City of Westfield, has been inspected by our engineer and your attention is called to the following recommendations made by him;

> "For a distance of eighty feet from the south end, the dam has an inclined apron attached. This apron was added in order to protect the penstocks from ice and the toe of the dam from erosion. The dam is not a very old structure being built about twenty-five years ago. It is in fair condition, except the apron already mentioned, which requires some repairs in the way of planking, etc."

Now therefore, in accordance with Section 46 of said Chapter 253, it is ordered that the above recommendations be complied with in a reasonable time.

Yours very truly,

COUNTY COMMISSIONERS

By____________________
Chairman.

____

____

Westfield River Watershed Association Inc

1960 Westfield

Watershed advocate.

City/Town	Westfield
Name	Westfield River Watershed Association Inc

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Gen.

July 12, 1960

The Hon. the Board of County Commissioners
Hampden County Court House
Springfield, Mass.

Gentlemen:

Reference is made to the communication of July 7, 1960 sent to you by Howard Mason, Jr. of the Westfield River Watershed Association. The undersigned was not able to attend the Water Resources Commission Meeting held at Woronoco on Monday evening, July 11. Previous commitments prevented by being in Woronoco.

Mr. Sterling, Engineer for the Water Resources Commission, stopped in to my office on Tuesday morning, July 12, to discuss the work in general of the Association, and to request certain information in connection with existing dams and bodies of water in the valley of the Westfield River. I have agreed to give Mr. Sterling this information and will review my records pertaining to dams and bodies of water so as to compile facts and data for use by Mr. Sterling.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

WESTFIELD RIVER WATERSHED ASSOCIATION, INC.

P. O. BOX 232 HUNTINGTON, MASS. 01050 TELEPHONE HUNTINGTON 667-[redacted]3646

October 31, 1968

Mr. William F. Stapleton, Chairman
Hampden County Commissioners
52 State Street
Springfield, Massachusetts

Dear Mr. Stapleton:

You and your associates are hereby notified of and invited to attend an "information meeting" at which projects now under consideration for developing and conserving the water and related land resources of the Westfield River valley will be presented and reviewed. The meeting will be held at:

7:30 P. M., Thursday, November 14, 1968

Westfield Junior High School, West Silver Street, Westfield, Mass.

The projects under consideration include a network of large and small water impoundments extending from Ashfield and Savoy on the north to Westfield on the south; from Chesterfield on the east to Washington and Becket on the west. There is scarcely a community in the Westfield River valley whose future will not be affected by this program as presently outlined and due to be incorporated soon in the nearly completed Comprehensive Investigation of the Connecticut River Basin's Water and Land Resources.

Among the objectives in this far-reaching project, in addition to more flood protection, are; maintenance of more uniform flow in the main river and many of its tributaries; development of the region's recreational resources, including impoundment of many more hundreds of surface acres of recreational water; improving the quality - temperature and cleanliness wise - of water; providing more favorable fish and wildlife environments.

Presentation of these plans will be made by Joseph L. Ignazio, Chief, River Basin Planning and William F. McCarthy, Jr., Chief, Environmental Resources Section of the Corps of Engineers and John L. Hull, Soil Conservation Service, USDA. Representatives of interested state, county and regional agencies are invited to attend.

The Westfield River Watershed Association, whose objectives include "the restoration and conservation of the natural resources of the watershed", is sponsoring this meeting as a public service to the community it is organized to serve.

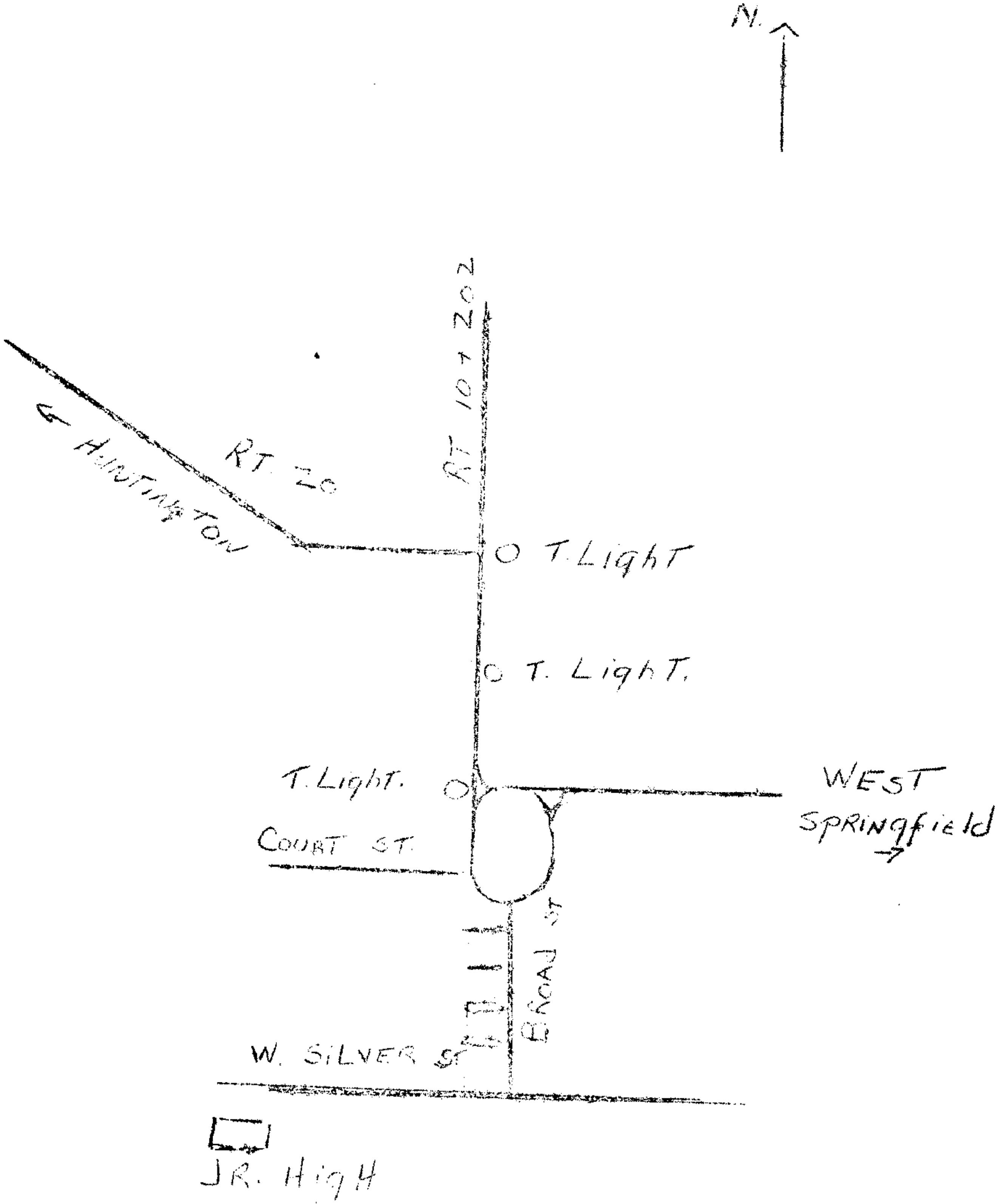
We look forward to seeing you and your associates the evening of November 14th.

Sincerely yours,

Weston B. Shepard Jr.

Weston B. Shepard, Jr., President

WBS:jpv


N.
RT 10 + 202
RT 20
← HUNTINGTON
T. Light
T. Light.
T. Light.
WEST SPRINGFIELD →
COURT ST.
BROAD ST
W. SILVER ST
JR. HIGH SCHOOL

Y M C A Dam

1970 Westfield

Dam formerly the property of Howard Smith and located off Northwest Road in Westfield.

City/Town	Westfield
Dam	Y M C A Dam
Name	Young Men's Christian Association
Name	Smith, Howard
Streets	Northweast Road

Commonwealth of Massachusetts

County of Hampden

Springfield, Mass.

Office of the
County Commissioners
52 State Street

William F. Stapleton
~~[illegible]~~
~~[illegible]~~
Floyd W. Fradet
Stephen A. Moynahan
Chairman

June 17, 1970

Young Men's Christian Association
67 Court Street
Westfield, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that your dam, formerly the property of Howard Smith and located off of Northwest Road in Westfield, has been recently inspected by our engineer and your attention is called to the following conditions noted and recommendations made by him.

> "The embankment of this small dam is in fairly good condition. All brush growth occurring on the top and on the downstream side of the dam embankment as well as along the toe of the dam embankment, should be cut down. A good grass turf should be developed in the areas where brush is now growing.
>
> The toe area of the embankment is fairly dry.
>
> The main spillway was o.k. and operating. Water in storage was at the crest of the spillway.
>
> The flood flow spillway at the left of the embankment needs maintenance. All debris, the broken footbridge, logs, etc., should be cleaned out of the spillway channel."

The recommendations contained in the report of the County Hydraulic Engineer are self-explanatory.

Any further information concerning this dam which you may desire will be furnished by our office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

Westfield City Water Dams

  - **Westfield**

Westfield Water Department Dams as follows:
Montgomery Reservoir Dam - Montgomery
Tekoa Reservoir Dam - Montgomery
Granville Dam - Granville
Winchell Reservoir Dam - Granville
Japhet Reservoir Dam - Granville
Fire Protection Dams -Arnold, Wells Mills & Strong Dams

Also See Dam Report Section: Westfield

Dam	Fire Protection Dams -(Arnold, Wells Mills & Strong Dams)
Dam	Tekoa Reservoir Dam
Dam	Montgomery Reservoir Dam
Dam	Granville Dam
Dam	Winchell Reservoir Dam
Dam	Japhet Reservoir Dam

INSPECTION OF THE

WESTFIELD WATER DEPARTMENT DAMS

Made September 7, 1955

By G. H. McDonnell
County Hydraulic Engineer

MONTGOMERY RESERVOIR DAM in Montgomery: (Earthen Dam)

The maximum height of water on the top of the dam during the flood of August 19th was 1 foot more or less above the top of the earth section of the dam. The downstream edge of the top of the earth dam is protected by a field stone masonry wall constructed partially with dry masonry and partially with cemented masonry. The water in rising over the top of the dam was prevented from freely running down the front face of the dam by the wall except in areas where the water passed through the masonry wall because of the dry joint condition.

The spillway has an approximate width of 20 feet and is equipped with flash boards 15 inches in height. The flash boards were apparently on the dam at the time of the flood. Flood waters in rising over the dam passed around the right side of the dam. The water then ran over natural ground through a wooded area and down the right valley bank into the brook near the gate house. In so doing, the water washed out the fill on the top right end of the dam. This fill apparently was placed when the dam was raised some years ago as a W.P.A. Project. The washout exposed the till or clay-like core and also exposed a masonry core below the till to a depth of approximately 5 feet below the top of the dam. This impervious core stood in good shape and shows little sign of damage.

The downstream slope of the dam shows minor earth washes and slides at three locations caused by washing of water that passed through the open spaces of the dry masonry wall in sufficient volume to cause the washouts. None of them are dangerous to the structure and only require minor refilling, loaming, and seeding.

In considering repairs and improvements to the dam, consideration should be given to providing additional spillway capacity. This capacity could be economically constructed on the right side of the dam in the area where the small wash around the end took place. This could be a wide swale spillway, short in length, discharging to the stream bed directly below the dam in the vicinity, and just downstream, of the present gate house.

The masonry wall along the top of the dam at the downstream edge proved itself a definite asset in preventing major damage to the earth embankment. This wall should be examined carefully to be sure that there is no undermining or misalignment because of the flood waters and the wall should be maintained in good condition for protective purposes.

TEKOA RESERVOIR in Montgomery: (Masonry Dam)

The Tekoa Reservoir Dam was overtopped along the length of the stone masonry. At the left abutment the water washed around the end of the masonry dam but did not eat through the soil except below the front face of the masonry wall extended. Underneath this area of washout there is solid ledge at about the elevation of normal water level in the Reservoir. This ledge extends upward into the left bank so that a complete washout and loss of the dam due to wash around this end is not likely to occur. The wash of water around the left end, however, did damage below the dam in the soil overlying the ledge and formed a large gulley that exposed the pipeline leading from the gate house at the central part of the dam to the City of Westfield.

The pipe as exposed is just above natural ledge and is now covered in part by boulders that have been washed in by the flood water.

The top of the right side of the masonry dam is at a higher level than the rest of the dam. While the dam to the left of the spillway notch was overtopped by about 2 feet of water, on the right there was little overtopping. This overtopping might have been in the neighborhood of 4 inches or 5 inches at the most. The overtopping was sufficient, however, to cause a washout in front of the masonry wall in the right valley bank. There is no evidence of ledge in the right bank at the washout, however the washout does not extend to the bottom of the masonry nor into the right bank deep enough to show the end of the masonry. Thus the right abutment may actually be ledge.

Recommended repairs would include the protection of the pipeline from boulders and stones by the covering of the pipeline with a sandy gravel. Also, the filling of the washout on the left bank. The washouts just below the masonry dam probably could be filled by either using material from the right bank at a point further downstream, or, since there is sand and gravel washed into the reservoir from upstream and in all probability the reservoir will be cleaned, this material could be used for general fill purposes.

It is felt that added spillway capacity is not absolutely necessary at this structure. The right bank could be better protected from overflow by providing a slight increase in height of the masonry at the right abutment, say to a foot or 18 inches above present level. This would require a check of the stability of the masonry dam for this added height. By raising the right side of the masonry it would be possible to eliminate the probability of overflow along the right bank. Overflow along the left bank in times of extreme storm could be tolerated insofar as the safety of the structure is concerned, because of the natural ledge condition. It would be advantageous, however, to do protective work along the left bank at the washout location below the dam. Should a storm silimar to the one of August 19th or one of greater intensity occur, the danger of losing the main pipeline would be eliminated. Any work that is done on the left bank should be done not so much as to guarantee an increase in overflow capacity of the dam for structural safety, but rather to guarantee protection to the pipeline leading from the gate house to the city.

Downstream of the masonry dam there is an undermining of some stone work in front of the main masonry portion of the dam. This is undermining of an apron placed following the

1938 flood to deflect and direct overflowing waters in such a way as to prevent washing out the soil below the dam. It has nothing to do with the stability or safety of the dam and the undermining of this masonry is of no major importance regarding the safety of the structure.

GRANVILLE DAM in Granville: (Earthen Dam)

From measurements taken on the 60 foot spillway, the height of water going over the spillway at the peak of the flood was about 7 feet. Looking downstream from the spillway into the narrowing portion of the spillway chute, it can be observed where the water entering the narrowing portion of the chute or channel jumped to the left and overflowed onto the bank behind the left wall. Because of the channel design and the high velocity of flow, the change in direction of water after it passed over the crest of the spillway was such as to cause the water at the peak flow to leap the wall and wash the dirt from behind the wall.

It is apparent from observing the depth of the washout that the foundation of the chute was nearly exposed. Further washout to any extent could cause failure of the spillway chute. Serious consideration must be given to the hydraulic design of the curve at the narrowing portion of the chute just below the spillway, so that water will not jump the chute and wash behind this left hand wall.

Downstream of the spillway at the point approaching a right hand turn in the chute, the left wall of the spillway failed, perhaps due to overtopping and undermining.

The entire natural soil to the left of the spillway chute for nearly 500 feet more or less downstream in the valley has been washed away and a vertical bank of natural earth in the direction of the dam exposed that approaches 30 to 40 feet in height. The washout is huge in proportions and defies word description. It must be seen to be appreciated. The washout extends in depth to natural ledge and the spillway chute is entirely broken and disintegrated. The entire left wall of the chute for 200 feet more or less is gone, and a major portion of the bottom is broken and fallen into the washout. The right hand wall has collapsed inward and an earth slide behind the wall has removed the support from behind the wall.

The distance of the washout below the toe of the dam is approximately 150 feet more or less. However, a continuation of the condition at the spillway as existed on the 19th could cause a further eating away of the bank in the upstream direction to finally reach the toe of the dam and cause complete failure of the structure.

It is essential that when redesigning the spillway chute consideration be given to its ability to properly withstand high flows and that downstream of the broken end of the spillway now discharging into this tremendous washout, protection be placed on the left side of the washout and against the natural soil that separates the washout from the toe of the dam. Redesign of the spillway just below the crest is needed for smoother hydraulic flow conditions at the narrowing section.

The old spillway chute downstream of this complete broken section at the right hand curve could be abandoned.

A downstream gate house is located just below the toe of the dam. At the present time boulders and gravel washed from the spillway washout are against the building and about 2 feet above floor level. The end of the discharge pipe from the reservoir is lost under the mass of boulders but water bubbles up through the boulders and flows on down to the stream below.

It would seem that any reconstruction of the spillway channel should provide enough protection on the left portion of the new spillway chute to prevent further discharge of water in the general area of the lower gate house. Also, this protection should be carried down far enough to guarantee that no water would ever again come close to the toe of the dam and thus endanger the structure.

Water did not come within 100 to 150 feet of the toe at the closest point, however, a continuation of the storm as occurred on Friday, August 19th, could conceivably cause a washout to continue back of the toe of the dam and result in the ultimate failure of the structure.

At the bottom of the old spillway chute the rampaging waters from the washout were turned to the right and ended up in the normal channel. There is a ledge outcrop with a vertical exposure across the valley at the left and just below the end of the spillway chute. The water flowing down valley to the left side of the spillway chute was diverted by this ledge outcrop back to the channel. From here the water followed the ordinary course of the brook on downstream.

Damage to the spillway chute at the lower section was negligible insofar as the chute itself is concerned. However, on the left side all soil is stripped to the bare rock from behind the chute wall and the chute wall stands bare, with no back support. It is surprising that the wall withstood the force of the waters.

WINCHELL RESERVOIR in Granville: (Masonry Dam)

Winchell Reservoir was topped across the entire length of the dam by about 18 inches of water. The only damage done downstream was the washing of some soil from in front of the stone masonry. This soil never extended very far. A majority of the stone masonry face was always exposed on the left bank and 50% more or less exposed on the right bank. The situation as it exists following the washout and the overflow of the whole dam does not constitute a dangerous situation. Repairs downstream should be such as to protect the banks of the stream based on maintenance problems. Insofar as stability of the structure is concerned, the left bank shows what appears to be solid ledge as a foundation for the left abutment wall.

Exposed on the right abutment downstream of the dam and also on the right bank of the dam are huge boulders. These appear to be the type of boulders that would generally overlay solid ledge. There is little likelihood of this dam being endangered by an overtopping such as just experienced. However, based on the fact that solid ledge does not definitely show on the right bank, it would be advisable to replace the washed out fill with heavy material and to pave over the fill in this area so that future overflows will be directed back into the stream on a paved or heavily riprapped section.

JAPHET RESERVOIR in Granville: (Masonry Dam)

This is a reservoir that is no longer in active use. The dam is a stone masonry structure. Water passed over the top of the stone masonry as well as through the central overflow weir. In passing over the structure, the water washed around the right end and caused a washout in front of the dam to the level of about the foundation of the stone masonry. The thickness of the stone masonry is such as to be apparently self-supporting. The washout to the right exposed what appears to be the right hand end of the stone masonry wall. Heavy tree growth on the right bank apparently prevented complete washout around the right end and thus saved the reservoir.

The left bank has a washout in front of the masonry where the earth has been washed away. The structure is generally safe but to guarantee its safety in the future, protection for each end should be provided so that future overflows will not cause an around-the-end washout.

This protection could be obtained with a swale spillway or by construction of a masonry wall on either end of the dam going deep enough into the earth to act as a core. This wall would then contain the overflow within the limits of the actual existing deep masonry.

FIRE PROTECTION DAMS - (Arnold, Wells Mills & Strong Dams)

These are very small dams located upstream of Granville Reservoir Dam and used for forming fire protection pools. They are in reasonably satisfactory condition.

CD-Westfield

TO THE COUNTY COMMISSIONERS OF THE COUNTY OF HAMPDEN:

We have submitted, under separate cover, plans and specifications showing repairs to various dams of the water supply system of the City of Westfield, Massachusetts. The Board of Public Works of the City of Westfield respectfully petitions your Board for approval of these plans and specifications for repairs to the following dams situated as indicated, all upon the property of the City of Westfield.

(a) Granville Reservoir Dam, located in the Town of Granville on Tillotson Brook, a tributary to Munn Brook.

(b) Winchell Reservoir Dam, located in Granville on Tillotson Brook just downstream from the Granville Reservoir, (a) above.

(c) Japhet Reservoir Dam, located in Granville on Japhet Brook just upstream from the confluence of Japhet Brook with Dickinson Brook.

(d) Montgomery Reservoir Dam, located in Montgomery on Moose Meadow Brook.

(e) Tekoa Reservoir Dam, and Diversion Dam, located in Montgomery on Moose Meadow Brook just upstream from the Westfield-Montgomery line.

(f) Chapin Reservoir Dam, known as Chapin Pond Dam, located in Westfield on Pond Brook just downstream from the outlet of Hampton Ponds.

The above Reservoir dams are all property of the Water Department of the City of Westfield and store water for use by the citizens of Westfield as a public water supply.

The work as proposed in the plans and specifications on the above listed dams consists of repairs to the dams as the result of the Flood of August 1955. It is intended that all repairs be made with strict compliance with the provisions and requirements of the plans and specifications.

Dated this thirteenth day of June 1956.

Ralph E. Sanville, Chairman
Board of Public Works
City of Westfield, Mass.

Tel. July 13/56 + talked
with Mr. Sheridan.
This draft of pet. OK.

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
STRUCTURAL ENGINEERING
ELECTRICAL ENGINEERING

TIGHE & BOND, INC.
CONSULTING ENGINEERS
~~189 HIGH STREET~~
HOLYOKE, MASSACHUSETTS
GEORGE H. MCDONNELL
PHILIP W. SHERIDAN

DAMS & POWER INSTALLATIONS
HIGHWAYS & BRIDGES
HOUSING DEVELOPMENT
WASTE DISPOSAL

→ NOTE: OUR NEW ADDRESS ←
BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS

CD-Westfield

July 9, 1956

Office of the County Commissioners
Hampden County Court House
Springfield, Massachusetts

Att. Miss Neilson

Dear Miss Neilson:

Enclosed please find a draft of the proposed petition as discussed by phone with you today. In preparing this draft I realized that I did not comment upon the Winchell Reservoir Dam in my letter report of June 28,56. Consequently I am including herewith a supplementary letter report dealing with the Winchell Reservoir dam.

If the enclosed draft of the petition is satisfactory, I will send a copy to the Board of Public Works for their use in preparing the actual petition. If you have any recommendations you could note them on one copy of the petition and return it to me.

Very truly yours

GHMcDonnell
George H.,McDonnell
County Hydraulic Engr

Enc.
GHM/cmb

CONTRACT FOR REPAIRS TO WATER SUPPLY SYSTEM
CITY OF WESTFIELD, MASS.

WHITMAN & HOWARD, INC.
ENGINEERS
89 Broad Street
Boston, Mass.

See Page 10 for County Commissioners' approval.

MAY, 1956

CONTRACT FOR REPAIRS TO WATER SUPPLY SYSTEM
CITY OF WESTFIELD, MASS.

WHITMAN & HOWARD, INC.
ENGINEERS
89 Broad Street
Boston, Mass.

MAY, 1956

TABLE OF CONTENTS

Page
ADVERTISEMENT 1

PROPOSAL 2,3,4,5,6,7,8

CONTRACT
ARTICLE 1 9
ARTICLE 2 9
ARTICLE 3 9
ARTICLE 4 SPECIFICATIONS OF THE WORK 10

Section 1. WORK TO BE DONE
(a) Locus - Plans 10
(b) Changes and Connections 10
(c) Extra Work 10
(d) Care of Watercourses, Sewers, Drains, etc 10
(e) Restoration of Services, etc. 10
(f) Order of Doing Work and Notification ... 10
(g) Time for Completion 11

Section 2. GENERAL DIRECTIONS
(a) Dimensions 11
(b) Lines and Grades 11
(c) Protection of Work 11
(d) Work in Progress and Final 11
(e) Sanitary Conveniences 11
(f) Care of Materials - Private Land not to be Occupied 11
(g) Lights, Guards, etc. 12
(h) Construction and Labor Conditions 12
(i) Night, Sunday or Holiday Work 12
(j) Materials to be Removed 12
(k) Removal and Disposal of Trees 12
(l) Existing Bridges 13
(m) Control of Water Supply 13
(n) Access to Work 13

Section 3. EXCAVATIONS
(a) Common Excavation 14
(b) Ledge or Rock 14
(c) Reservoir Excavation 14
(d) Spoil Areas 14

Section 4. FILL
(a) General 15
(b) Placing 15
(c) Borrow Areas 15

Section 5. GROUTED RIP-RAP
(a) Materials 16
(b) Construction Methods 16

Page

Section 6. CONCRETE
(a) Materials 17
(b) Reinforcing Bars 17
(c) Placing 17
(d) Curing 17
(e) Finishing 17

Section 7. FIELD STONE MASONRY
(a) Materials 18
(b) Mortar 18
(c) Placing 18
(d) Pointing 18

Section 8. TIMBER STRUCTURES
(a) Materials 19
(b) Construction Methods 20

Section 9. LOAMING AND SEEDING
(a) Materials 21
(b) Construction Methods 21

Section 10. GRANVILLE RESERVOIR 22

Section 11. WINCHELL RESERVOIR 23

Section 12. JAPHET RESERVOIR 24

Section 13. MONTGOMERY RESERVOIR 24

Section 14. BRIDGE NO. 2 25

Section 15. BRIDGE NO. 1 25

Section 16. TEKOA BRIDGE 26

Section 17. TEKOA RESERVOIR 26,27

Section 18. ROADWAYS 27

Section 19. HUMBURT GUTTER 28

Section 20. CHAPIN POND 28

Section 21. MISCELLANEOUS
(a) Insurance Requirements 29
(b) Reserve Police Officer 29

ARTICLE 5. Time 30
ARTICLE 6. Access to Work 30
ARTICLE 7. Defective Work, Approvals, etc. .. 31
ARTICLE 8. Employees to be Competent 31
ARTICLE 9. Not to Assign or Sublet 31

Page

ARTICLE 10. Alterations 31
ARTICLE 11. Responsibility 31,32
ARTICLE 12. Abandonment of Work, etc. 32,33
ARTICLE 13. Damages for Delay 33
ARTICLE 14. Extra Work - Contractor's Claims. 33,34
ARTICLE 15. Money to be Retained 34
ARTICLE 16. Prices for Work 34,35,36,37,38
ARTICLE 17. Laws and Regulations - State and Federal .. 39
ARTICLE 18. Hours of Work - In re Lodge, Board or Trade 39
ARTICLE 19. Contractor to Pay All Claims for Labor, etc. 40
ARTICLE 20. Payments to Contractor 40
ARTICLE 21. City not to be Liable 41
ARTICLE 22. Wage Rates 41,42

SIGNATURE PAGE 43

BOND 44

DEFAULT AGREEMENT 45,46

CITY OF WESTFIELD, MASS.

Invites Proposals

For repairs to water supply system, including repairing and replacing dams, channels, bridges and roadways; excavating reservoirs, etc., in Hampden County, Mass., for the City of Westfield, Mass. A bond of not less than the amount of the contract, with satisfactory surety, for faithfully doing the work, will be required.

The office copy of the contract for the work can be seen and the proposal to be used can be obtained from the Board of Public Works, Westfield, Mass., and at the office of Whitman & Howard, Inc., Engineers, 89 Broad Street, Boston, upon the deposit payment of $10.00. Said deposit will be refunded if such documents are returned in good condition at or before the time for opening bids.

The proposal must be filled out and signed as directed therein, sealed in an envelope addressed to the Board of Public Works of the City of Westfield, Mass., endorsed with the name and address of the bidder and "Proposal for Repairs to Water Supply System", and submitted with a certified check for $8,000.00, payable to the City of Westfield, at the Water Department Office, City Hall, Westfield, Mass., on or before 7:30 o'clock p.m., Eastern Daylight Saving Time, Thursday, May 31, 1956; this check to be the property of the said City if the bidder fails to execute the contract and satisfactory bond within seven days after the contract may have been awarded to him.

Attention is called to the fact that minimum wage rates are established for the project as set forth in the contract documents.

Proposals filled out and left with check, as above directed, and no other will at the above-named hour and place be publicly opened and read, and the undersigned reserve the right to reject any or all proposals, or to accept the proposal they deem best for the City.

The bidder shall start the work under this contract within seven calendar days after its acceptance by the Board of Public Works.

No proposal may be withdrawn within thirty days of the opening of bids.

CITY OF WESTFIELD, MASS.

By its Board of Public Works

Ralph E. Sanville, Chairman
Gerald Fitzgerald
Edward M. Egleston

PROPOSAL

FOR REPAIRS TO WATER SUPPLY SYSTEM for the City of Westfield, Mass.

TO: Board of Public Works, City of Westfield, Mass.

The undersigned declares that no person in the employ of the said City is pecuniarily interested in this proposal or in the contract for the work which he proposes to do; that he has carefully examined the office copy of the contract and specifications and has informed himself fully in regard to all conditions pertaining to the site or sites where the work is to be done, and carefully estimated on the work. He understands that the City, its agents and employees are not to be in any manner held responsible for the accuracy of, or bound by, any estimates or plans, or underground structures relating to the work, and that if any have been given or made, they are to be considered solely as a base for filling out and comparing the several proposals.

The undersigned proposes to furnish all the labor and equipment required for repairing and replacing dams, channels, bridges, and roadways; excavating reservoirs, etc., in Hampden County, Mass., for the Board of Public Works, City of Westfield, Mass., in accordance with the accompanying specifications and plans prepared by Whitman & Howard, Inc., Engineers, 89 Broad Street, Boston, Mass., for the sums specified below, subject to additions and deductions or deletions, according to the specifications and in all respects according to the terms thereof.

The undersigned proposes and agrees that within seven days next after the day on which notice of the acceptance of this proposal shall be given to him or mailed to him at the address hereinafter given, he will sign in quadruplicate in the form of the office copy thereof, a contract for doing the work described in said copy; and will execute and deliver to said Board of Public Works for said City, a bond in the sum specified in said copy and accompanied with properly executed Default Agreement in the attached form, conditioned to faithfully furnish and do everything required of the contractor in said copy, with a surety company authorized to do business in the Commonwealth of Massachusetts satisfactory to said Board of Public Works as Surety, the undersigned to receive and the City to allow as payment for the work, including everything furnished or done by, or resulting to, the Contractor in doing the work, the sums stated in the several items as follows.

It is understood that the quantities given in this proposal are approximate only andare given as a basis for comparison of the proposals. The City does not expressly or by implication agree that the actual amount of work will even approximately correspond herewith but reserves the right to increase or decrease or delete the amount of any item of the work listed as may be found desirable or necessary during the carrying out of this construction work and the unit prices for increasing or decreasing the amount in the items quoted in the proposal shall apply without change to such variation in the quantity of each of the items.

This proposal may be accepted by the Board of Public Works at any time within thirty days of the opening of bids.

(Fill out prices with ink in writing and in figures; in case of discrepancy between prices in writing and in figures, the writing shall govern. In case of discrepancy between total of items and total of bid amount stated, total of items shall govern.)

Bidders must quote on all items.

Item 1. For furnishing and placing fill at Granville Reservoir, including all necessary grading, rolling, compacting and other incidental items of work required for the formation of embankments, roadways and other graded areas, the lump

sum of ____________________________________

____________________________ Dollars ($).

Item 2. For excavating the existing by-pass channel and adjacent areas at Granville Reservoir, including repairs to existing concrete and masonry by-pass channel, and other incidental items of work, the lump sum of ______________

____

Dollars ($).

Item 3. For furnishing and installing concrete at Granville Reservoir to restore damaged walls and slab of spillway channel to original lines and grade, including all underdrains, form work, finishing, etc., the lump sum of

____

Dollars ($).

Item 4. For furnishing and placing loaming and seeding at Granville Reservoir, including all loaming, seeding, rolling, etc., the lump sum of ______________________

____________________________ Dollars ($).

Item 5. For furnishing and placing fill at Winchell Reservoir, including all necessary grading, rolling, compacting, and other incidental items of work required for the formation of embankments, and other graded areas, the lump sum of

____

Dollars ($).

Item 6. For furnishing and placing all materials at Winchell Reservoir required to restore the spillway channel to original lines and grade including all fill, excavation, rip-rap, etc., the lump sum of ______________________

____________________________ Dollars ($).

Item 7. For furnishing and installing loaming and seeding at Winchell Reservoir, including all loaming, seeding, rolling, etc., the lump sum of ______________________________

______________________________ Dollars ($).

Item 8. For excavating and disposing of about 6,200 cubic yards of reservoir excavation at Winchell Reservoir, the sum of

____

Dollars ($), per cubic yard.

Item 9. For furnishing and placing fill at Japhet Reservoir, along with loaming and seeding, including all necessary grading, rolling, compacting, etc., all in the area adjacent to the masonry dam, the lump sum of ______________________________

______________________________ Dollars ($).

Item 10. For excavating and disposing of about 600 cubic yards of reservoir excavation at Japhet Reservoir, the sum of

____

Dollars ($), per cubic yard.

Item 11. For incidental items of work at Montgomery Reservoir, including filling washout atop dam, and along masonry wall atop dam, and loaming and seeding washed out areas along downstream face of dam, the lump sum of ______________________________

____

Dollars ($).

Item 12. For furnishing and placing all materials at Bridge No. 2 required to restore to original lines and grade, including all fill, excavation, rolling, compacting, repair of masonry abutments, and other incidental items of work, the lump sum of ______________________________

______________________________ Dollars ($).

Item 13. For furnishing and installing all material at Bridge No.1 required to restore to original lines and grade, including all fill, excavation, rolling, compacting, construction of abutments and timber bridge, and other incidental items of work, the lump sum of ______________________________

______________________________ Dollars ($).

Item 14. For furnishing and installing all materials at Tekoa Bridge required to construct concrete abutments and timber bridge, and other incidental items of work, the lump sum of

Dollars ($).

Item 15. For furnishing and placing fill at Tekoa Reservoir, including all necessary grading, rolling, compacting, and other incidental items of work required for the formation of embankments, roadways, and other graded areas, the lump

sum of
Dollars ($).

Item 16. For excavating spillway channel at Tekoa Reservoir, including removal of trees and disposal of all materials and other incidental items of work, the lump sum of

Dollars ($).

Item 17. For furnishing and placing loaming and seeding at Tekoa Reservoir, including all loaming, seeding, rolling, etc., the lump sum of

Dollars ($).

Item 18. For excavating and disposing of about 8,500 cubic yards of reservoir excavation at Tekoa Reservoir, the sum of

Dollars ($), per cubic yard.

Item 19. For incidental items of work at Tekoa Reservoir including construction of diversion dam; removing superstructure; placing concrete roof slab and removal of sand, gravel and debris at the existing valve chamber; and repairing chain link fence atop the dam, the lump sum of

Dollars ($).

Item 20. For regrading, filling and shaping existing roadways shown on plans, and other incidental items of work in connection therewith, the lump sum of

Dollars ($).

Item 21. For work at Humburt Gutter, including excavating channel, filling over water main and repairing masonry culvert, the lump sum of ____________________

____________________ Dollars ($).

Item 22. For about 300 cubic yards of ledge and boulder excavation at Granville, Winchell, Japhet, Montgomery and Tekoa Reservoirs, at bridge sites, and at Humburt Gutter, the sum of ____________________

____________________ Dollars ($), per cubic yard.

Item 23. For furnishing and installing all materials at Chapin Pond necessary for the construction of the earth dam, roadway, manhole, piping, rip-rap, etc., including all grading, rolling, compacting and incidental items of work, the lump sum of ____________________

____

Dollars ($).

Item 24. For extra work and materials furnished under order in writing by the Engineers, on their usual stationery, the City will allow such increased compensation as referred to in Article 14.

Total amount of Proposal based on Engineer's estimate of quantities:

____

____________________ Dollars ($).

The undersigned further agrees that the certified check left by him with said Board of Public Works, payable to the City of Westfield, Mass., shall be the property of said City if he shall fail to carry out said proposal, otherwise the check is to be delivered up to him on his receipt therefor. The amount of said check is agreed upon by the undersigned and said City to be the damages which said City will sustain by such failure.

(Bidder) ____________________

By ____________________

(Title) ____________________

This proposal must bear the written signature of the bidder or an authorized agent of the bidder. If the bidder is a corporation or a partnership the bid must be signed by a duly authorized officer of such corporation or by a partner and the title of such officer must be stated. If the bidder is a corporation the corporation seal must be impressed on this page.

(Address) ______________________

____

(Date) ______________________

CONTRACT FOR REPAIRS TO WATER SUPPLY SYSTEM in Hampden County, Mass. for the City of Westfield, Mass.

The City of Westfield, a municipal corporation located in the Commonwealth of Massachusetts, by its Board of Public Works, duly authorized and without personal liability for the individual members thereof, and

____,

hereinafter designated as the Contractor, agree as follows:

ARTICLE 1. The Contractor shall do all the work and furnish all the materials, except as herein otherwise specified, necessary or proper for performing and completing the work hereinafter specified.

ARTICLE 2. Whenever the word "City" is used in this agreement it shall be understood to mean the City of Westfield, Mass., acting through its Board of Public Works. The word "Board" shall mean the Board of Public Works of the City of Westfield, Mass. The word "Engineer" or "Engineers" or pronouns in place of them shall be deemed to refer to Whitman & Howard, Inc., Engineers, acting for the said Board of Public Works of the City of Westfield, either directly or through their properly authorized assistants or agents, such assistants or agents acting severally within the scope of the particular duties entrusted to them.

ARTICLE 3. All the work under this agreement or contract shall be done to the satisfaction of the Engineers, who shall in all cases determine the amount, quality, acceptability and fitness of the several kinds of work and materials which are to be paid for hereunder and shall decide all questions which may arise as to the fulfillment of this contract on the part of the Contractor and their determination and decision thereon shall be final and conclusive; and such determination and decision, in case any question shall arise, shall be a condition precedent to the right of the Contractor to receive any money hereunder.

The plans and specifications, proposal and addenda shall form part of this contract.

HAMPDEN COUNTY
APPROVED
SEP 12 1956
William [illegible]
Thomas F. Sullivan
Ralph E. Walsh

ARTICLE 4. SPECIFICATIONS OF THE WORK

Section 1. WORK TO BE DONE

Locus.

(a) The work to be done is to furnish and install all necessary materials for repairing and replacing dams, channels, bridges and roadways; excavating reservoirs; filling; loaming and seeding; grading, etc., together with all appurtenances, in Hampden County, in private lands, public streets, private ways, etc., conforming so far as they go to plans of the proposed work entitled:

Plans.

"Repairs to Water Supply System, Westfield, Mass.", dated May, 1956, Sheet 1 of 13 to Sheet 13 of 13 , inclusive,

all made by Whitman & Howard, Inc., Engineers, 89 Broad Street, Boston, on file with the Board of Public Works, and any changes, drawings, plans and directions that may from time to time be furnished by the Engineers.

Changes and Connections.

(b) Make changes in existing or new structures to meet the requirements of the work and connections therefor and add new construction for these purposes where necessary.

Extra Work.

(c) Furnish all extra work and materials that may be ordered in writing by the Engineers on their usual stationery.

Care of Watercourses, Sewers, Drains, etc.

(d) Maintain the flow in all watercourses, water pipes, sewers, drains and pipes interfered with by the Contractor, or convey the flow in covered channels to a suitable point of discharge in such a manner as not to flow upon or hinder the other work or cause any nuisance.

Restoration of Services, etc.

(e) Care for, replace and restore to good condition, satisfactory to the Engineers any public or private way, sewer, drain, water, gas, or other pipe, catch basin, wire, cable, building, fence, post, pole, mail box or other structure interfered with by the Contractor. Protect existing water pipes and other utilities and repair or replace all pipes or conduits damaged by the Contractor.

Order of Doing Work and Notification.

(f) The Contractor shall notify the Water Department of the City of Westfield in writing at least two days before he begins work under this Contract.

The Contractor shall start actual construction work under this Contract at such locations as the Engineers may direct.

Time for Completion. (g) The Contractor shall complete the above work within 125 consecutive calendar days from and including the date of Contract.

Section 2. GENERAL DIRECTIONS

Dimensions. (a) Figure dimensions in preference to scale dimensions are to be followed in all plans and drawings.

Lines and Grades. (b) The Engineers will furnish information pertaining to surveys and bench marks sufficient for controlling the layout of the work. The Contractor shall employ, at his own expense, a competent civil engineer who shall stake out the lines and grades for the work; establish levels, including a permanent bench, and erect batter boards at such locations that they will not be disturbed during the construction of the work. All reference marks shall be verified by an instrument at frequent intervals and the Contractor shall be responsible for the accuracy of all lines and grades relative to the project.

Protection of Work. (c) All work is to be carefully protected so that no injury will come to it from water, frost, accident or other cause, and any injury which may come to the work is to be repaired by the Contractor.

Work in Progress and Final. (d) Extreme care is to be taken that the work, and all appurtenances, shall be done carefully, well and completely and if later, errors, omissions, or poor work are discovered they shall be thoroughly repaired and rectified by the Contractor up to the time of the acceptance of the entire contract by the Engineers and the City.

Sanitary Conveniences. (e) The Contractor is to provide all necessary sanitary conveniences, properly secluded from public observation, and shall carry out all directions relating to same given by the Engineers. The Contractor is reminded that work will be done on watershed areas and will require his special attention so that no waste or other harmful material will enter into the water supply system. The use of chemically treated toilets will be required on all watershed areas.

Care of Materials. (f) The Contractor to have charge of, and be liable for the loss of, or injury to, any materials delivered to him, on or in the vicinity of the work, to be used thereon, and furnish men to handle them for examination by the Engineers or their assistants; shall keep trimmed up in piles, so placed as not to endanger the work, all materials so delivered, whether furnished by him or the City, and all refuse, rubbish and materials until removed, and

Private Land not to be Occupied. shall not occupy private land without the approval of the Engineer and permission from the owner or his authorized agent.

Lights, Guards, etc.

(g) The Contractor shall at all times leave an unobstructed way along public and private ways for travelers, autos and trucks, and for access to hydrants; shall from the beginning of twilight, through the whole of every night, place and maintain over or near all places in the public or private ways obstructed or made unsafe by the Contractor in doing the work, and over or near all materials for the work placed therein, sufficient lights to protect travelers from injury; shall provide walks for travelers over or around such places and materials; shall not unnecessarily inconvenience the neighboring residents; shall provide all necessary fences, guards and watchmen; shall build bridges and ways for access to property where the existing access is cut off by him, and shall take all proper precautions to protect persons and property from injury by the carrying on of the work.

Construction and Labor Conditions.

(h) Bidders are required to inform themselves fully of the conditions relating to construction and labor under which the work will be or is now being performed, and this Contractor must employ so far as possible, such methods and means in the carrying out of his work as will not cause any interruption or interference with any other contractor.

Night, Sunday or Holiday Work.

(i) No night, Sunday or holiday work requiring the presence of an Engineer or inspector will be permitted, except in case of emergency, and then only to such an extent as is absolutely necessary, and with written permission of the Engineers, provided that this clause shall not operate in case of a gang organized for regular and continuous night work, and on work which, in the opinion of the Engineers, can be satisfactorily performed at night.

Materials to be Removed.

(j) The Contractor to promptly remove from the work and its vicinity all rejected materials and the surplus earth, refuse, rubbish and excavated materials to spoil areas as shall be directed by the Engineers and shall dispose of them without expense to the City.

Removal and Disposal of Trees.

(k) No tree shall be removed without the consent of the Engineers and when trees are so designated they shall be removed and disposed of to the satisfaction of the Engineers. Trees not designated for removal shall be protected from damage.

Existing Bridges. (l) Existing bridges encountered during the progress of the work shall be protected from all damage from Contractor's equipment, blasting, etc.

Control of Water Supply. (m) Control of the flow of water at dams, reservoirs, spillways, gate houses, etc., shall be controlled by the Engineers. Under no circumstances shall the Contractor change the controls or divert any flow without permission.

Access to Work. (n) Access roads, ramps, temporary bridges, etc., required during construction shall be built at the discretion of the Contractor and at his own expense, subject to approval by the Engineers.

Section 3. EXCAVATIONS

Common Excavation.

(a) Common excavation shall include the removal and satisfactory disposal of all material, such as clay, sand, gravel, debris, loam, decomposed rock, boulders of less than one cubic yard and trees and stumps designated to be removed by the Engineers. Excavations for foundations shall include all necessary sheeting, dewatering, etc., necessary for the execution of the work. Excavated material suitable for fill may be incorporated into the embankments, otherwise it shall be wasted at spoil areas designated on plans. No separate payment shall be made for common excavation, and all costs in connection therewith shall be included under the applicable lump sum contract prices.

Ledge and Rock.

(b) Ledge requiring blasting for its removal and boulders of one cubic yard or more shall be measured by the Engineers at the point of removal and shall be disposed of in a manner satisfactory to the Engineers. No other material, including soft and disintegrated rock which can be removed without the use of explosives, shall be classified as ledge or rock excavation. Ledge or rock shall be paid for at the contract unit price per cubic yard under Item 22.

Reservoir Excavation.

(c) Reservoir excavation shall include the removal and satisfactory disposal of all material, such as sand, gravel, clay, debris, etc., within the limits of the reservoirs, as shown on plans. Facilities are available so that the reservoirs may be drained and the water level maintained at a minimum during excavation operations. Excavated material suitable for fill may be incorporated into the embankments, otherwise it shall be wasted at spoil areas designated on plans. Reservoir excavation will be required at Winchell, Japhet and Tekoa Reservoirs. All reservoir excavation will be measured in its original position by such methods as the Engineers deem suitable and shall be paid for at the applicable contract unit prices.

Spoil Areas.

(d) Excavated material, including sand, gravel, debris, boulders, etc., to be wasted shall be deposited at spoil areas shown on plans. Spoil areas shall be neatly trimmed, shaped to afford adequate drainage and shall be left in a condition satisfactory to the Engineers.

Section 4. FILL

General. (a) Fill shall include furnishing and placing all materials and all items of work required for the formation of embankments, roadways, ditches, gutters, and other graded areas, including hauling, placing, rolling, compacting, shaping, etc. Approved excavated material and material from "Borrow Areas" designated on plans will be available for fill. Washed gravel and/or crushed stone required for the work shall be furnished by the Contractor. No separate payment shall be made for fill and all costs in connection therewith shall be included under the applicable lump sum contract prices.

Placing. (b) Fill shall be placed in horizontal layers of not more than 12-inches before compaction. Each layer shall be spread uniformly by the use of a bulldozer, road machine or other approved device and thoroughly compacted with a crawler-type tractor or power roller. Boulders and ledge to be incorporated in the fill shall be so placed as to have at least 12-inches of cover.

Borrow Areas. (c) Fill required for the work will be furnished by the City at no expense to the Contractor and will be available at "Borrow Areas" indicated on the plans. Clearing, grubbing, stripping, and removal of all boulders encountered in the excavations at borrow areas will not be measured or paid for separately. Borrow areas shall be neatly trimmed, shaped to afford adequate drainage and shall be left in a condition satisfactory to the Engineers.

Section 5. GROUTED RIP-RAP

(a) Materials. Grout for grouted rip-rap shall consist of one part of Portland cement and three parts of sand, thoroughly mixed with water to produce grout having a thick, creamy consistency. Stone for the rip-rap shall consist of field stone or rough, unhewn quarry stone as nearly rectangular in section as is practicable. The stone shall be dense, resistant to the action of air and water, and suitable in all other respects for the purpose intended. The stones shall weigh between 50 and 150 pounds each andat least 60 per cent of them shall weigh more than 80 pounds each.

(b) Construction Methods. The stones shall be laid with close joints. The courses shall be laid from the bottom of the bank upward, the larger stones being placed in the lower courses. After the stones are in place, the spaces between them shall be completely filled with grout from bottom to top, and the surface swept with a stiff broom. No rip-rap shall be grouted in freezing weather, and in hot, dry weather the work shall be protected from the sun and kept moist for at least three days after grouting.

Section 6. CONCRETE

(a) Materials. Concrete shall be mixed in the proportion by volume of one part Portland cement, 2 parts sand, 4 parts stone, with a proper amount of suitable water to produce a 2500 lb. test concrete. Cement shall be Portland cement, conforming to the standard specification of the American Society for Testing Materials C-150-49. Sand shall be well graded, clean, sharp, free from foreign matter and proper for concrete construction. Stone shall be crushed stone or screened gravel, clean, hard, strong, uncoated and durable, all passing 1-1/2-inch sieve, well graded and having not more than 5 per cent less than the 1/4-inch size.

(b) Reinforcing Bars. Reinforcing bars shall be of new billet steel, deformed bars, of sizes shown on drawings. All excess rust and mill scale shall be removed before placing and bars shall be securely wired in place at proper spacing before placing concrete.

(c) Placing. Water shall be removed from excavations before placing concrete and shall be kept from washing over freshly deposited concrete. Concrete shall be placed in forms and properly vibrated, to entirely fill the forms, without settling coarse aggregates. Concrete that has attained its initial set or concrete that contained its water content for more than 1-1/2 hours shall not be deposited in the work.

(d) Curing. Concrete surfaces exposed to conditions causing premature drying shall be protected by covering as soon as possible with canvas, straw, burlap or other satisfactory material and kept moist, or if the surfaces are not covered, they shall be kept moist by flushing or sprinkling. Curing shall continue for a period of not less than seven days after placing the concrete.

(e) Finishing. After removal of forms, all depressions and rod holes shall be filled with mortar. All exposed concrete surfaces shall have high points removed and shall be rubbed until an even, uniform finish is attained.

Section 7. FIELD STONE MASONRY

Materials. (a) Stone for field stone masonry shall consist of sound, durable, blasted, or field stone, free from seams, cracks and other structural defects and of a shape and quality as approved by the Engineers. Individual stones when set in the walls shall have no face dimension less than 8 inches.

Mortar. (b) Mortar shall be mixed in the proportion of one part cement to two parts sand. Materials to be as described under "concrete". The mortar shall be used within 45 minutes after mixing. Retempering of mortar will not be permitted.

Placing. (c) Selected stone, roughly shaped to provide suitable exposed faces, shall be used at all angles and at ends of walls. All shaping of stone shall be done before the stone is placed in the wall. Headers shall occupy at least 1/4 the face area, shall be evenly distributed through the wall, and shall hold in the heart of the wall. Each stone shall be free from dirt, oil, or any injurious material which may prevent the proper adhesion of the mortar, and shall be wetted before being set in mortar. The wall shall be compactly laid, having all interior joints filled with suitable stones or spalls thoroughly bedded in mortar.

Pointing. (d) Joints not pointed at the time the stone is laid shall be thoroughly wet with clean water and filled with mortar. The mortar shall be well driven into the joints and finished with an approved pointing tool. The wall shall be kept wet while pointing is being done and in hot or dry weather the pointed masonry shall be protected from the sun and kept wet for a period of at least three days after completion. After the pointing is completed and the mortar set, the wall shall be thoroughly cleaned and left in a neat condition.

Section 8. TIMBER STRUCTURES

(a) 1. Lumber: The lumber used shall be Douglas Fir, Coast Region, 1700f. - Dense No. 1, or better, according to the specifications of the National Lumber Manufacturers' Association (March, 1952). All lumber used shall be sound, well seasoned and straight grained, free from shakes and large or loose knots and shall have no decayed wood, worm holes, or any defects which, in the opinion of the Engineers, will impair its strength or durability for the purpose intended. Pieces of exceptionally light weight will not be accepted.

The Contractor shall notify the Engineers as to the source of supply of the lumber and he shall also furnish to the Engineers for approval, two certified copies of the grading, made in accordance with the rules of the West Coast Bureau of Lumber Grades and Inspections for Douglas Fir.

Materials.

2. Preservative: All timber used in this contract will be pressure treated with Grade 1 creosote oil. The preservative shall conform to the requirements of the current standard specifications for creosote preservative of the American Wood Preservers' Association. The minimum amount of preservative retained shall be 12 pounds per cubic foot of wood-empty cell.

The Contractor shall notify the Engineers of the name and location of the treatment plant or plants as soon as the Contractor has placed his order for treating lumber. The Contractor shall furnish to the Engineers for approval two copies of a certificate from the treating plant or plants stating that the methods of treatment conform to the requirements specified, and two copies of a certificate giving the chemical analysis of the preservatives. These certificates shall be furnished before any material is placed. Furnishing of the certificates by the Contractor shall not act as a bar to rejection of any materials by the Engineers if he finds that they do not meet the requirements. Any cost involved in furnishing the certificates shall be borne by the Contractor.

3. Fastenings: All fastenings shall be genuine wrought iron or best quality steel. Steel fastenings shall be galvanized by the hot dip method and shall have a continuous coating of pure zinc of uniform thickness weighing not less than 2 ounces per square foot. Washers shall be used under all heads and nuts. They shall be of the same material as the bolts. All nails shall be galvanized. The nuts of all bolts shall be effectually locked after they have been finally tightened.

(b) 1. Workmanship: Workmanship shall be first class throughout. None but competent carpenters shall be employed and all framing shall be true and exact. Unless otherwise specified, nails and spikes shall be driven with just sufficient force to set the heads flush with the surface of the wood. The workmanship on all metal parts shall conform to the requirements specified for steel structures.

Construction Methods.

2. Handling: Treated timber shall be carefully handled without sudden dropping, breaking of outer fibers, bruising or penetrating the surface with tools.

3. Framing and Boring: All cutting, framing and boring of treated timbers shall be done before treatment in so far as is practicable. All bolt holes bored after treatment shall be treated with creosote oil. Any unfilled holes, after being treated with creosote oil, shall be plugged with creosoted plugs.

4. Cuts and Abrasions: All cuts in treated timbers and all abrasions, after having been carefully trimmed, shall be covered with two applications of a mixture of 60 per cent creosote oil and 40 per cent roofing pitch or brush coated with at least two applications of hot creosote oil and covered with hot roofing pitch.

Section 9. LOAMING AND SEEDING

Materials.

(a) Materials for loaming and seeding operations shall be as follows:

1. Loam shall consist of approved, fertile, friable topsoil typical of the locality, without admixture of subsoil, refuse, or other foreign materials. It shall be a mixture of sand, silt and clay, with a normal amount of organic matter, free from stumps, roots, hard dirt, stiff clay, stones larger than 1-inch in diameter, sticks, brush, and other litter. The Contractor shall notify the Engineers of the location of the loam to be used on the job so that its suitability for loaming operations can be determined prior to stripping.

2. Seed mixture shall be as follows:

Chewings Fescue or Creeping Red Fescue	25%
Alta Fescue	30%
Domestic Rye Grass	20%
Red Top	15%
White Clover or Alsike	10%

Seed mixture impurity content shall not be higher than 8%.

3. Fertilizer shall be furnished in original containers, plainly marked with chemical analysis and shall have a Nitrogen-Phosphate-Potash, minimum composition by weight of 10-6-4, 8-6-4, or 7-7-7.

Construction Methods.

(b) Loam shall be furnished, hauled, deposited and spread over such areas as directed by the Engineers, and shall be raked with steel rakes to remove all clods, stones, brush, roots and other foreign matter. Loam shall be placed in depths sufficient to provide a minimum 4-inch depth after compaction. After raking, fertilizer shall be spread on the top layer of loam at the rate of 0.2 pounds per square yard and shall be worked into the top two or three inches of loam, sprinkled with water, and allowed to stand for one day before seeding. Seed shall be sown only between the periods from April 15 to June 1 and from August 15 to October 15, or as directed by the Engineers. Seed shall be evenly sown at the rate of 3.6 pounds per 100 square yards, shall be covered with a thin layer of loam by raking and shall be rolled with hand rollers. After grass has appeared, any area which fails to show a uniform stand of grass shall be reseeded to the satisfaction of the Engineers.

Section 10. GRANVILLE RESERVOIR

Under Item 1, the Contractor shall furnish, place, compact, etc., approximately 15,000 cubic yards of fill in areas shown on plans to be filled. Special care shall be taken in filling around the existing exposed cast iron water main so as not to damage the pipe or break the joints. Fill around the pipe shall be hand tamped to provide a suitable foundation for the pipe. Hand tamping will also be required to compact fill in the washed out areas under the existing concrete spillway channel.

Under Item 2, the Contractor shall excavate and dispose of all material in and around the existing by-pass channel. Special care shall be taken in excavating around the existing concrete and masonry portion of the channel so that no further damage results. Location and elevations of existing channel are approximate and proposed grading adjacent to channel will be adjusted to meet existing conditions after excavation. Repairs to the channel will also be included under this item.

Under Item 3, the Contractor shall repair and replace portions of the existing concrete spillway channel, including installation of the open joint underdrain and surrounding drainage fill, tile wall drains, and miscellaneous items of work.

Under Item 4, the Contractor shall loam and seed all graded areas shown on plans and washed out areas shown on plans. The Contractor shall also fill where necessary and loam and seed the washed out areas on the downstream face of the dam and the areas adjacent to the south end of the dam. Approximately 10,000 square yards of loaming and seeding will be required.

Section 11. WINCHELL RESERVOIR

Under Item 5, the Contractor shall furnish, place, compact, etc., approximately 1,100 cubic yards of fill required along sides of existing spillway channel, as shown on plans. Fill required in washed out bottom of spillway channel shall be included under Item 6.

Under Item 6, the Contractor shall fill washed out bottom of spillway channel and furnish and place grouted rip-rap therein, shall construct rip-rap channel walls, as shown on plans, and shall excavate channel, as shown on plans.

Under Item 7, the Contractor shall furnish and install approximately 1,400 square yards of loaming and seeding for all graded areas shown on plans.

Under Item 8, the Contractor shall excavate sand, gravel, boulders, debris, etc., from within the limits of the reservoir, as shown on plans.

Section 12. JAPHET RESERVOIR

Under Item 9, the Contractor shall fill, loam and seed the washed out area adjacent to the existing masonry dam, including all grading, rolling, compacting, etc.

Under Item 10, the Contractor shall excavate sand, gravel, boulders, debris, etc., from within the limits of the reservoir, as shown on plans. Special care shall be taken so as not to damage the existing paved bottom of the reservoir, and any damage resulting shall be repaired at the Contractor's expense.

Section 13. MONTGOMERY RESERVOIR

Under Item 11, the Contractor shall fill washout at end of dam and shall fill, loam and seed washed out areas along masonry wall and areas on downstream face of dam.

Section 14. BRIDGE NO. 2

Under Item 12, the Contractor shall fill washed out areas adjacent to bridge, including rolling, grading, compacting, etc.; shall repair existing masonry abutments; shall remove fallen trees adjacent to bridge and shall clear all sand, gravel, debris, etc., from bridge deck.

Section 15. BRIDGE NO. 1

Under Item 13, the Contractor shall fill washed out areas adjacent to bridge, including rolling, grading, compacting, etc.; shall repair existing masonry abutments; shall construct timber bridge; shall clear channel at bridge of trees, remains of old bridge, gravel, boulders, debris, etc. Boulders of 1 cubic yard or more to be removed from the channel shall be paid for under Item 22.

Section 16. TEKOA BRIDGE

Under Item 14, the Contractor shall furnish and install all materials necessary to construct concrete abutments and timber bridge. Excavation and backfill required will be included under Items 15 and 16.

Section 17. TEKOA RESERVOIR

Under Item 15, the Contractor shall furnish, place, compact, etc., approximately 2,500 cubic yards of fill required at areas shown on plans. Special care shall be taken to provide a suitable foundation for the existing exposed cast iron drain at the end of the dam.

Under Item 16, the Contractor shall excavate approximately 900 cubic yards of material for the spillway channel, to the lines and grade shown on plans.

Under Item 17, the Contractor shall furnish and install approximately 5500 square yards of loaming and seeding for all graded areas shown on plans.

Under Item 18, the Contractor shall excavate sand, gravel, boulders, debris, etc., from within the limits of the reservoir as shown on plans.

Under Item 19, the Contractor shall furnish and place all materials necessary to construct diversion dam at upper end of reservoir; shall remove superstructure and install concrete slab at the existing valve house; shall remove sand, gravel, debris, etc., from existing valve house, and shall repair the damaged portions of the chain link fence and cast iron drain at the end of the dam.

Section 18. ROADWAYS

Under Item 20, the Contractor shall fill, regrade and shape about 5.5 miles of roadways shown on Drawing No. 1. Roadway washout near Winchell Reservoir, indicated on plan, shall be repaired by the City. The Contractor shall also clean out all existing corrugated metal and stone box culverts along these roads and shall remove fallen trees and overhanging branches from the path of the roadways. It is the intention of this specification to restore these roads to original condition, shaped to afford proper drainage and passable.

Section 19. HUMBURT GUTTER

Under Item 21, the Contractor shall repair the existing masonry culvert, fill over the existing cast iron water main and excavate sand, gravel, debris, etc., from the existing channel, as shown on plans.

Section 20. CHAPIN POND

Under Item 23, the Contractor shall furnish and install all materials necessary for the construction of the earth dam, including manhole, valve, piping, concrete walls, rip-rap, roadway, loaming and seeding, etc., as shown on plans.

Section 21. MISCELLANEOUS

(a) The Contractor shall take out and maintain during the life of this contract Workmen's Compensation Insurance for all employees employed at the site of the project, in the manner and to the extent provided for in Chapter 152 of the General Laws and amendments thereto.

Precaution shall be exercised at all times for the protection of persons and property. Contractor and subcontractors to furnish the Engineers with three copies of certificate of insurance covering each policy applicable.

Insurance Requirements.

The minimum amount of insurance shall be as follows:

Contractor: Public Liability Insurance not less than $15,000 for insurance including wrongful death to any one person and subject to the same limit for each person in an amount not less than $30,000 on account of one accident.

Subcontractor: Public Liability Insurance not less than $15,000 for insurance including wrongful death to any one person and subject to the same limit for each person in an amount not less than $30,000 on account of one accident.

Contractor: Property Damage Insurance - Contractor shall also provide property damage coverage, including damage from blasting, in the amount of $10,000 on account of one accident and $20,000 in the aggregate.

Sub-contractor: Property Damage Insurance - Subcontractors shall also provide property damage coverage, including damage from blasting, in the amount of $10,000 on account of one accident and $20,000 in the aggregate.

The Contractor and Sub-contractors may omit from the Property Damage Insurance the including of damage from blasting, and provide in place thereof a satisfactory "blasting bond".

Reserve Police Officer.

(b) Any reserve police officer employed by the Contractor shall be paid the prevailing wage rates paid to regular police officers of the City of Westfield.

ARTICLE 5. The Contractor shall, within seven days after the approval as to final execution of this Contract, commence work at such point or points as the Engineers shall direct and shall thereafter continue at such point or points and in such order or procedure as they may from time to time direct.

The rate of progress shall be regular and consistent and shall be such that the whole work shall be performed in accordance with the terms of this contract within the time of completion specified in Article 4, Section 1 (g). The time in which this contract is to be performed and the work is to be completed is of the essence of this agreement.

Time.

It is agreed that the rate of progress herein required has been purposely made low enough to allow for the ordinary delays incident to the seasonal as well as other difficulties of construction work of this character. No extension of time will be made for ordinary delays, inclement weather and accidents, and the occurrence of such will not relieve the Contractor from the necessity of maintaining this rate of progress.

If delays are caused by acts of God, acts of Government or State, strikes, extra work or other contingencies clearly beyond the control or responsibility of the Contractor, the Contractor shall be entitled to so much additional time wherein to perform and complete this Contract on his part as the Engineers shall certify in writing to be just.

The Contractor shall promptly start the work to be done under this Contract and shall continue it to completion with all practical dispatch.

Access to
Work.

ARTICLE 6. The Board and the Engineers, agents and employees of the Board or City, may, for any purpose, enter upon the work and premises used by the Contractor, and the Contractor shall provide safe and proper facilities therefor. The other agents, employees or Contractors of the City may also, for all purposes which may be required by their work or Contract, enter upon the work and any differences or conflicts which may arise between the Contractor and other workmen or Contractors of the City in regard to their work shall be adjusted by the Engineers.

The Board and the Engineers, agents and employees of the Board or City may inspect at the point of manufacture any materials to be used in the work and reject such materials as are not satisfactory.

Defective Work, Approvals, etc.

ARTICLE 7. The inspection and/or approval of the work, or any part of the work, shall not relieve the Contractor of any of his obligations to fulfill his contract as herein prescribed and defective work shall be made good and unsuitable materials and equipment may be rejected notwithstanding that such work, materials and equipment or drawings of same have been previously overlooked or approved by the Engineers and accepted or estimated for payment. If the work or part thereof shall be found defective and/or unsatisfactory at any time before the final acceptance of the whole work, the Contractor shall forthwith make good such defect in a manner satisfactory to the Engineers, and if any materials brought upon the ground for use in the work, or selected for the same, shall be condemned by the Engineers as unsuitable or not in conformity with the specifications, the Contractor shall forthwith remove such materials from the vicinity of the work.

Employees to be Competent.

ARTICLE 8. The Contractor shall employ only competent men to do the work and whenever the Engineers shall notify the Contractor that any man on the work is, in his opinion, incompetent, unfaithful disorderly, or otherwise unsatisfactory, such man shall be discharged from the work and shall not again be employed on it, except with the consent of the Engineers.

Not to Assign or Sublet.

ARTICLE 9. The Contractor shall give his personal attention constantly to the faithful prosecution of the work, shall keep the same under his personal control and shall not assign, by power of attorney or otherwise, nor sublet the work or any part thereof, without the previous written consent of the Board, and shall not, either legally or equitably, assign any of the moneys payable under this agreement, or his claim thereto, unless by and with the like consent of the Board.

Alterations.

ARTICLE 10. The Engineers may make alterations in the line, grade, plan, form, dimensions or materials of the work, or any part thereof, either before or after the commencement of construction; if such alterations diminish the quantity of work to be done, they shall not warrant any claim for damages or for anticipated profits on the work that may be dispensed with; if they increase the amount of work, such increase shall be paid for according to the quantity actually done at the price stipulated for such work under this contract.

ARTICLE 11. The Contractor shall take all responsibility of the work and take all precautions for preventing injuries to persons and property in or about the work; shall bear all losses resulting to him on account of the amount or character of the work, or because the nature of the land in or on which the work is done is different from what was estimated or expected, or on account of the weather, elements or other cause and he shall assume the defense of and indemnify and save harmless, the City and its officers, agents and servants, from all claims relating to labor and materials furnished for the work; to inventions, patents and patent rights used in doing the work; to injuries to any person or corporation or property received or sustained by or from the Contractor and his employees in doing the work, or in consequence of any improper materials, implements or neglect of the Contractor and his employees therein.

Responsibility.

Abandonment of Work, etc.

ARTICLE 12. If the work to be done under this Contract shall be abandoned, or if this Contract or any part thereof shall be sublet, without the previous written consent of the Board, or if the Contract or any claim thereunder shall be assigned, by the Contractor otherwise than as specified herein, or if at any time the Engineers shall be of opinion, and shall so certify in writing to the Board, that the conditions herein specified as to the rate of progress are not fulfilled or that the work or any part thereof, is unnecessarily or unreasonably delayed or that the Contractor has violated any of the provisions of this Contract, the Board may notify the Contractor to discontinue all work or any part thereof, and thereupon the Contractor shall discontinue such work or such part thereof, as the Board may designate, and the Board may thereupon by contract or otherwise, as they may determine, complete the work or any part thereof, and charge the entire expense of so completing the work or part thereof, to the Contractor, and for such completion the City for itself or for its contractors, may take possession of and use or cause to be used in the completion of the work or part thereof any materials, machinery, implements and tools of every description as may be found upon the line of said work. All expenses charged under this Article shall be deducted and paid by the City out of any moneys then due or to become due the Contractor under this Contract, or any part thereof; and in the accounting thereof the City shall not be held to obtain the lowest figures for the work of completing the Contract or any part thereof, or for insuring the proper completion, but all sums actually paid therefor, shall be charged to the Contractor. In case the expenses so charged are less than the sum which would have been payable under this Contract if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference; and in case such expense shall exceed the said sum, the Contractor shall pay the amount of excess to the City.

Abandonment of Work, etc.

Damages for Delay.

ARTICLE 13. The Contractor shall pay to the City all expenses, losses and damages, as determined by the Engineers, incurred in consequence of any defect, omission or mistake of the Contractor or his employees, or the making good thereof and shall also pay, for each and every calendar day that he shall be in default in completing the work as herein provided, the sum of Forty Dollars ($40.00), which sum is hereby agreed upon, not as a penalty but as the damages which the City will suffer daily by reason of such default.

Extra Work.

ARTICLE 14. The City may at any time, by a written order, and without notice to the sureties, require the performance of such Extra Work or changes in the work as it may find necessary or desirable. The amount of compensation to be paid to the Contractor for any extra work, as so ordered, shall be determined as follows:

(a) By such applicable unit prices, if any, as are set forth in the Contract; or by such unit prices as may be agreed upon between the City and the Contractor;

(b) If no such unit prices are so set forth, or, if no unit price is agreed upon between the City and the Contractor, then by a lump sum mutually agreed upon by the City and the Contractor; or

(c) If no such unit prices are so set forth, or, if no unit price is agreed upon between the City and the Contractor, and if the parties cannot agree upon a lump sum then by the actual net cost in money to the Contractor of the materials and of wages of applied labor (including premiums for Workmen's Compensation Insurance) required for such extra work, plus such rental for plant and equipment (other than small tools) required and approved for such extra work, plus fifteen percentum (15%) as compensation for all other items of profit, and costs or expense including administration, overhead, Extra Work.

superintendence, insurance (other than Workmen's Compensation Insurance), materials used in temporary structures, allowances made by the Contractor to sub-contractors, additional premiums upon the performance bond of the Contractor and the use of small tools. The provisions hereof shall not affect the power of the Contractor to act in case of emergency, as hereinafter provided.

Contractor's Claims.

If the Contractor claims compensation for extra work not ordered as aforesaid, or for any damage sustained, he shall, within one week after the beginning of any such work or sustaining of any such damage, make a written statement to the Engineers of the nature of the work performed or damages sustained, and shall, on or before the fifteenth day of the month succeeding that in which any such damage shall have been sustained, file with the Engineers an itemized statement of the details and amount of such work or damage; and unless such statements shall be made as so required, his claim for compensation shall be forfeited and invalid, and he shall not be entitled to payment on account of any such work or damage. The determination of the Engineers shall be final upon all questions of the amount and value of extra work, but in no greater amount than is approved in writing by the Board.

Money to be Retained.

ARTICLE 15. The City may keep any moneys which would otherwise be payable at any time hereunder and apply the same, or so much as may be necessary therefor, to the payment of any expenses, losses or damages incurred by the City and determined as aforesaid and may retain until all claims are settled, so much of such moneys as the Board shall be of opinion will be required to settle all claims against the City, its officers, agents or servants, specified in Article 11.

Prices for Work.

ARTICLE 16. The City shall pay and the Contractor shall receive as full compensation for everything furnished and done by the Contractor under this Contract, including all work required but not included in the items hereinafter mentioned, and also for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from any unforeseen obstruction or difficulty encountered in the prosecution of the work, and for all expenses incurred by or in consequence of the suspension of the work as herein specified and for well and faithfully completing the work, and the whole thereof, as herein provided as follows:

Item 1. For furnishing and placing fill at Granville Reservoir, including all necessary grading, rolling, compacting and other incidental items of work required for the formation of embankments, roadways and other graded areas, the lump sum of ______________________

______________________ Dollars ($).

Item 2. For excavating the existing by-pass channel and adjacent areas at Granville Reservoir, including repairs to existing concrete and masonry by-pass channel, and other incidental items of work, the lump sum of ______________

______________________ Dollars ($).

Prices for Work.

Item 3. For furnishing and installing concrete at Granville Reservoir to restore damaged walls and slab of spillway channel to original lines and grade, including all underdrains, form work, finishing, etc., the lump sum of

____

______________________ Dollars ($).

Item 4. For furnishing and placing loaming and seeding at Granville Reservoir, including all loaming, seeding, rolling, etc., the lump sum

of ______________________________________

______________________ Dollars ($).

Item 5. For furnishing and placing fill at Winchell Reservoir, including all necessary grading, rolling, compacting, and other incidental items of work required for the formation of embankments, and other graded areas, the lump sum of ______________________

______________________ Dollars ($).

Item 6. For furnishing and placing all materials at Winchell Reservoir required to restore the spillway channel to original lines and grade including all fill, excavation, rip-rap, etc., the lump sum of ______________________

______________________ Dollars ($).

Item 7. For furnishing and installing loaming and seeding at Winchell Reservoir, including all loaming, seeding, rolling, etc., the lump sum of ______________________________

______________________ Dollars ($).

Item 8. For excavating and disposing of each cubic yard of reservoir excavation at Winchell Reservoir, the sum of ______________________

______________________ Dollars ($).

Prices for Work.

Item 9. For furnishing and placing fill at Japhet Reservoir, along with loaming and seeding, including all necessary grading, rolling, compacting, etc., all in the area adjacent to the masonry dam, the lump sum of

____

______________________ Dollars ($).

Item 10. For excavating and disposing of each cubic yard of reservoir excavation at Japhet Reservoir, the sum of ______________________

______________________ Dollars ($).

Item 11. For incidental items of work at Montgomery Reservoir, including filling washout atop dam, and along masonry wall atop dam, and loaming and seeding washed out areas along downstream face of dam, the lump sum of

____

______________________ Dollars ($).

Item 12. For furnishing and placing all materials at Bridge No. 2 required to restore to original lines and grade, including all fill, excavation, rolling, compacting, repair of masonry abutments, and other incidental items of work, the lump sum of ______________________

____
Dollars ($).

Item 13. For furnishing and installing all material at Bridge No. 1 required to restore to original lines and grade, including all fill, excavation, rolling, compacting, construction of abutments and timber bridge, and other incidental items of work, the lump sum of

____

______________ Dollars ($).

Item 14. For furnishing and installing all materials at Tekoa Bridge required to construct concrete abutments and timber bridge, and other incidental items of work, the lump sum of

Prices for Work.

______________________________ Dollars ($).

Item 15. For furnishing and placing fill at Tekoa Reservoir, including all necessary grading, rolling, compacting, and other incidental items of work required for the formation of embankments, roadways, and other graded areas, the lump sum of ______________

______________________________ Dollars ($).

Item 16. For excavating spillway channel at Tekoa Reservoir, including removal of trees and disposal of all materials and other incidental items of work, the lump sum of

______________________________ Dollars ($).

Item 17. For furnishing and placing loaming and seeding at Tekoa Reservoir, including all loaming, seeding, rolling, etc., the lump sum of ______________________

______________ Dollars ($).

Item 18. For excavating and disposing of each cubic yard of reservoir excavation at Tekoa Reservoir, the sum of ______________

______________ Dollars ($).

Item 19. For incidental items of work at Tekoa Reservoir including construction of diversion dam; removing superstructure; placing concrete roof slab and removal of sand, gravel and debris at the existing valve chamber; and repairing chain link fence atop the dam, the lump sum of ____________

____________ Dollars ($ ____________).

Item 20. For regrading, filling and shaping existing roadways shown on plans, and other incidental items of work in connection therewith, the lump sum of ____________

____________ Dollars ($ ____________).

Prices for Work.

Item 21. For work at Humburt Gutter, including excavating channel, filling over water main and repairing masonry culvert, the lump sum

of ____________

____________ Dollars ($ ____________).

Item 22. For each cubic yard of ledge and boulder excavation at Granville, Winchell, Japhet, Montgomery and Tekoa Reservoirs, at bridge sites, and at Humburt Gutter, the sum of

____________ Dollars ($ ____________).

Item 23. For furnishing and installing all materials at Chapin Pond necessary for the construction of the earth dam, roadway, manhole, piping, rip-rap, etc., including all grading, rolling, compacting and incidental items of work, the lump sum of ____________

____________ Dollars ($ ____________).

Item 24. For extra work and materials furnished under order in writing by the Engineers, on their usual stationery, the City will allow such increased compensation as referred to in Article 14.

Laws and Regulations.

ARTICLE 17. The Contractor shall keep himself fully informed of all State and National laws, and municipal ordinances and regulations in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency is discovered in the specifications or Contract for this work in relation to any such law, ordinance, regulation, order or decree, he shall forthwith report the same to the Engineers in writing. He shall at all times himself observe and comply with, and shall cause all his agents and employees to observe and comply with, all such existing and future laws, ordinances, regulations, orders and decrees; and shall protect and indemnify the City and the Board and their officers and agents against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by himself or his employees.

State and Federal.

All the materials furnished and work done are to comply with all State and Federal laws and regulations.

Hours of Work.

ARTICLE 18. In the employment of mechanics, teamsters, chauffeurs and laborers in the construction of this public works, the Contractor shall give preference, first, to citizens of the Commonwealth who have served in the army or navy of the United States in time of war and have been honorably discharged therefrom or released from active duty therein, and who are qualified to perform the work to which the employment relates; and secondly, to citizens of the Commonwealth generally, and, if they cannot be obtained in sufficient numbers, then to citizens of the United States. Preference shall be given to veterans and citizens who are residents of the City of Westfield, Mass. No laborer, workman, mechanic, foreman or inspector working within this Commonwealth in the employment of the Contractor, subcontractor, or other person doing or contracting to do the whole or a part of the work contemplated by this Contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of extraordinary emergency.

In re Lodge, Board or Trade.

Every employee in the work covered by this Contract shall lodge, board and trade where and with whom he elects, and neither the Contractor nor his agents or employees shall, directly or indirectly, require as a condition of employment therein, that the employee shall lodge, board or trade at a particular place or with a particular person.

Contractor to Pay All Claims for Labor, etc.

ARTICLE 19. The Contractor further agrees that he will pay for all labor performed or furnished, and for all material used or employed, including lumber used on the project but not incorporated in the work, and for the rental or hire of vehicles, steam shovels, rollers propelled by steam or other power, concrete mixers, tools and other appliances and equipment used or employed in the carrying out of this contract, and shall pay all persons who contract with the principal for labor and materials on account of the work herein contemplated and that he will furnish the Board at its request with evidence satisfactory to the Board that all persons who have done work or furnished anything under this contract and all claims of private corporations or individuals for damage of any kind caused by the construction of said work have been fully paid or satisfactorily secured and in case such evidence is not furnished the Board may cause to be retained out of any amount due the Contractor sums sufficient to cover any such unpaid claims. While it is understood that the security required to be given by the Contractor to satisfy the conditions of statute law by his giving the bond accompanying this contract, the City may nevertheless cause any moneys retained or to become due to be held and applied to the payments for labor or materials for which security is required under the provisions of law.

Payments to Contractor.

ARTICLE 20. The City, so long as the Contractor continues to carry on the work, shall make monthly payments therefor as follows: The Engineers shall each month prior to the completion of the work estimate the value of the work done to the date of the estimate and thereupon the City shall deduct from such estimate ten per cent (10%) thereof, all previous payments, all amounts to be kept under the preceding Articles and shall pay the balance of such estimate to the Contractor; shall ninety-one (91) days after the completion of the work estimate the total amount to be allowed under the preceding Articles and thereupon the City shall deduct from such amount one per cent (1%) thereof, all previous payments and all amounts to be kept under the preceding Articles, and shall pay the balance to the Contractor, and shall six months after the completion of the work deduct from the amount of said one per cent (1%) and keep for its own all expenses incurred by the City on account of defects, omissions or mistakes of the Contractor in the work, discovered by the Engineers since the preceding payment and pay the balance to the Contractor.

City not to be Liable.

ARTICLE 21. The City shall not be liable to the Contractor except as provided in the preceding Articles, and on making the last payment aforesaid, shall be released from all claim or liability to the Contractor for anything done or furnished for or relating to said work, or for any acts or neglect of the City or of any person relating to or affecting said work, except for the remainder, if any there be, of the amounts retained as aforesaid.

Wage Rates.

ARTICLE 22. In compliance with Chapter 461, Acts of 1935, the following Classifications of Labor and Minimum Wage Rates applying thereto, have been established by the Department of Labor and Industries of the Commonwealth of Massachusetts.

Classifications of Occupations	Rate per Hour
Hoisting Engineer	$3.00
Assistant Engineer: On Steam Machines	2.40
On Other Machines	2.10
Crane Operator	3.00
Power Shovel Operator	3.00
Trenching Machine Operator	3.00
Tractor Operator	2.55
Bulldozer Operator	2.55
Grader Operator	2.55
Compressor Operator - 220 cu. ft. or less	2.00
Over 220 cu. ft.	2.45
Jack Hammer Operator	2.15
Roller Operator	2.47-1/2
Concrete Mixer Operator - 1 bag	1.90
2 bags or more	2.40
Pumpman	2.45
Other Power Driven Equipment	2.47-1/2
Bricklayer	3.27-1/2*
Cement Finisher	3.27-1/2*
Stone Cutter	2.25
Stone Mason	3.27-1/2*
Mason Tender	2.15
Catch Basin & Manhole Builder	3.27-1/2*
Carpenter	2.77-1/2**
Pile Driver & Cofferdam Builder	2.85
Iron Worker	3.38***
Painter	2.55
Blaster	2.40
Truck Driver	2.19-1/2
Euclid Operator	2.45

* After 9-1-56, $3.37-1/2

** After 6-1-56, $2.82-1/2

*** After 7-1-56, $3.53

Wage Rates

Classifications of Occupations (Continued)	Rate per Hour
Pipe Layer	$1.90
Stone Spreader	1.90
Asphalt Raker	1.90
Curb Setter	2.05
Common Laborer	1.90
Water Boy	1.00
Electrician	3.05
Granite Cutter	3.08
Operator of 3 axle equipment	2.25

IN WITNESS WHEREOF, the parties to these presents have caused these presents to be signed and sealed this ________ day of ____________ in the year nineteen hundred and fifty-six.

City of Westfield, Mass. (______________________________

By its (______________________________

Board of Public Works (______________________________

______________________________ Contractor

By ______________________________

(If the Contractor is a partnership, fill out the following, giving the full name of each partner.)

The above contracting ____________________ consists of the following members:

________________________ residing ________________________

________________________ residing ________________________

________________________ residing ________________________

(If the Contractor is a corporation, give its place of organization, its president and treasurer.)

Place of Organization ______________________________

President ______________________________

Treasurer ______________________________

BOND

KNOW ALL MEN BY THESE PRESENTS,

That we, ...
an individual a partnership a corporation organized under the laws of the State of .... having an usual place of business in .... as principal, and .... a corporation organized under the laws of the State of .... and having an usual place of business in .... as surety, are holden and stand firmly bound and obligated unto the City of Westfield, Mass., as obligee in the amount of ....

....
Dollars ($), lawful money of the United States of America to and for the true payment whereof we bind ourselves, and each of us, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said principal has by means of a written agreement dated ...., 1956, entered into a contract with the said obligee for Repairs to Water Supply System, and all incidental work, a copy of which agreement is attached hereto and by reference made a part hereof.

NOW THE CONDITION of this obligation is such that if the said principal shall well and truly keep and perform all the agreements, terms and conditions of said contract on his part to be kept and performed and shall also pay for all labor performed or furnished, and for all material used or employed including lumber used on the project but not incorporated in the work, and for the rental or hire of vehicles, steam shovels, rollers propelled by steam or other power, concrete mixers, tools, and other appliances and equipment used or employed in the carrying out of said contract, and shall pay all persons who contract with the principal for labor and materials, then this obligation shall be void; otherwise it shall remain in full force and virtue.

And the said surety, for value received, hereby stipulates and agrees that no change in, or extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any wise affect its obligations on this bond and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

IN WITNESS WHEREOF, we have hereunto set our hands and seals this __________ day of ______________ in the year One Thousand, Nine Hundred and Fifty-Six.

______________________________ (Seal)
(Principal)
By ___________________________

______________________________ (Seal)
(Surety)
By ___________________________

See Default Agreement
attached, to be executed
by Surety.

DEFAULT AGREEMENT

____
(Name of Company Furnishing Bond)

____
(Applicable Branch Office Address)

____
(Office Address of Undersigned)

____
(Date)

Contractor: ______________________
Contract: ______________________
____
____

____
(Municipality)

____
(State)

Bond # ______________

Gentlemen:

This is to advise that in the event the principal on the above captioned bond shall be in default, and the ______________ (Municipality) so declares him in default and terminates his right to proceed under the contract as referred to in the bond, (the ______________ (Municipality) having performed its obligations under said contract), and the ______________ (Municipality), shall further request the ______________ (Surety), as Surety, to take over and complete the said contract, the ______________ (Surety) will exert every effort to secure bids from other contractors for the completion of the said contract and the work thereunder. If successful in securing satisfactory bids, the ______________ (Surety) will award a contract for the completion of the work to the lowest responsible bidder who can furnish bond, and who is mutually acceptable to the ____________________ (Municipality) and the ______________________________ (Surety). This is on condition, however, that the lowest acceptable bid for the completion of the original contract, plus outstanding labor and material bills and other obligations of the principal for which the Surety may be liable, less the remaining unpaid balance under the contract, shall not exceed the penalty of the Surety's bond, and on the further condition that ____________________ (Municipality) recognizes the right of the ______________________________ (Surety) to all balances remaining unpaid under the said contract, earned or unearned, and agrees to pay such balances over to the ____________________ (Surety) as the work progresses, and periodically as called for by the original contract between the principal, as herein referred to, and the ____________________ (Municipality).

Very truly yours,

____
Attorney-in-Fact.

1874 Reports

Description of Lands Taken and Location Maps for Westfield Water Works - 1874 - by the Town of Westifeld by Act of Massachusetts Legislature approved May 29, 2873. See: Hampden County Registry of Deeds Book 308, Page 346 for description of tracings.

City/Town	Westfield
City/Town	Montgomery
Name	Atwater
Name	Horton, Samuel
Name	Moore, Octerlony
Name	Moore, Oliver A
Name	Moore, Horace F
Name	Williams, Frances E
Name	Thompson, David
Name	Phelan, Elisha
Name	Deneen, Jere
Name	Hines, Patrick
Name	Mallory
Name	Simmons
Name	Dibble, John
Name	Perry, David
Name	Collins, Erastus
Name	Atkins, Martin

Name	Atkins, Dennis
Name	Yeamans
Name	Phelan, John
Name	Cooley, Charles
Name	Moseley, David
Name	Massachusetts Comm
Name	Bancroft, Edward
Railroads	New Haven & Northampton Railroad
Railroads	Boston & Albany Railroad
Streets	North Elm Street
Streets	Pochassic Road
Water	Westfield River

DESCRIPTION OF LANDS TAKEN
AND LOCATION MAPS.

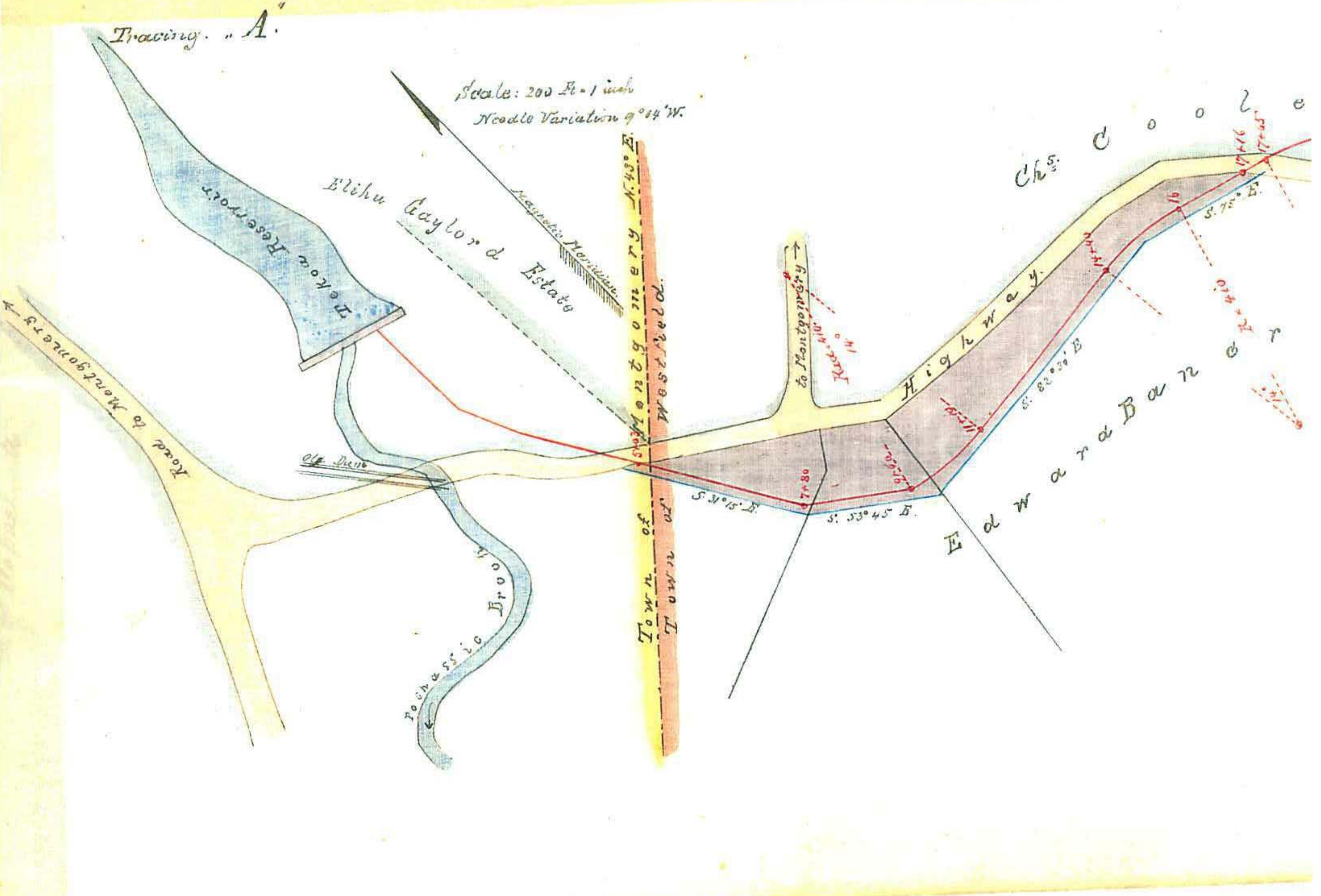
WESTFIELD WATER WORKS.

1874.

Commonwealth of Maſsachusetts
Hampden SS.

Received July 18th 1874 and filed with Hampden County
Deeds By James E. Ruſsell Register

Tracing. "A"


Scale: 200 Ft. = 1 inch
Needle Variation 9° 14' W.
Magnetic Meridian
Tekoa Reservoir
Elihu Gaylord Estate
Road to Montgomery
Old Dam
Pochassic Brook
Town of Montgomery
Town of Westfield
N. 43° E.
S. 43°
to Montgomery
Rad. 410'
14°
Highway
Chs. Cooley
Edward Bander
S. 31° 15' E.
S. 53° 45' E.
S. 82° 30' E
S. 75° E.
7+80
9+60
11+19
14+40
16
17+16
17+65
R. = 410
14°

Description of Land

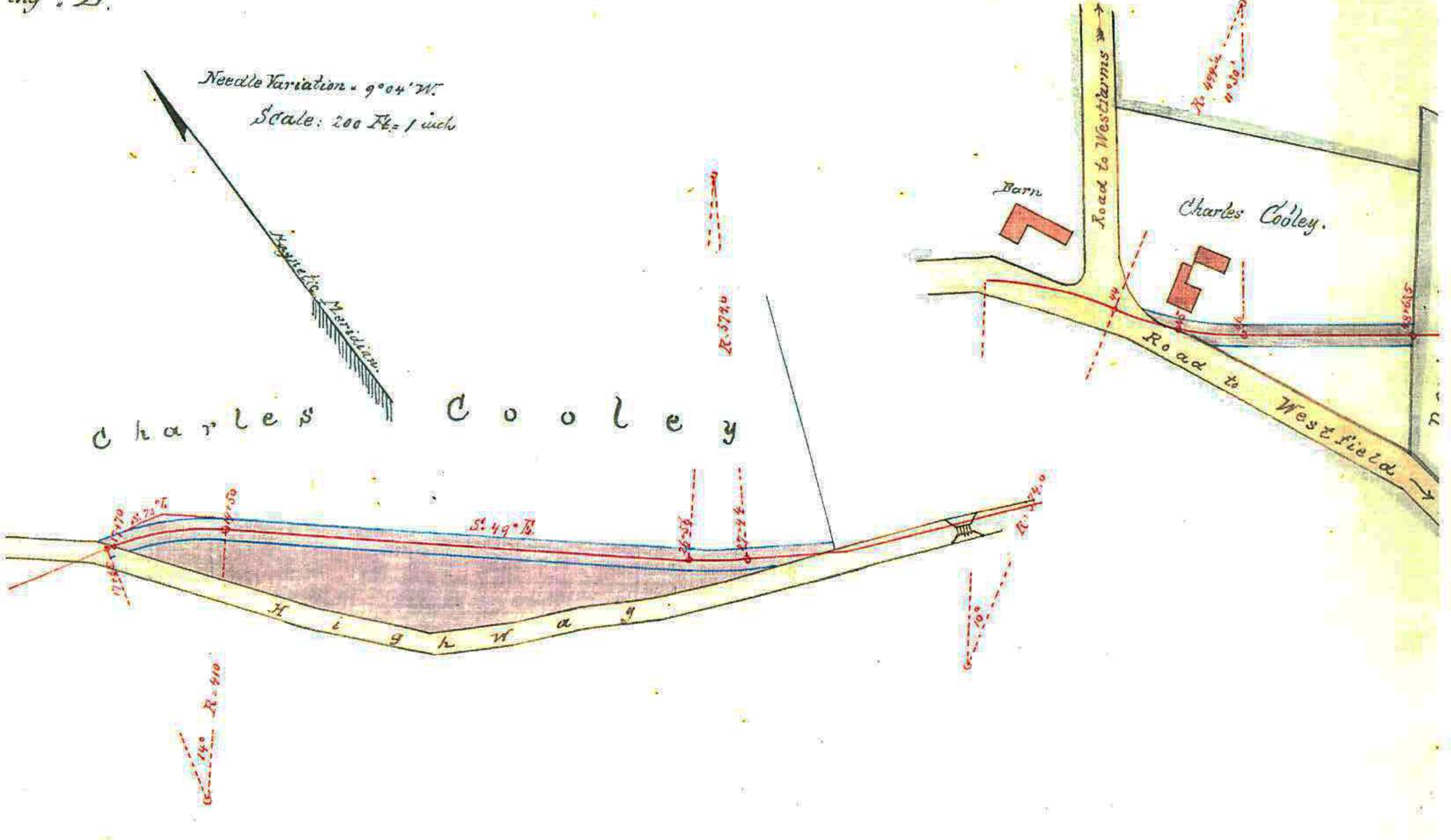
The Town of Westfield in accordance with the authority given by an act of the Legislature of Massachusetts entitled an act to supply the Town of Westfield with pure water approved May 29 1873. and for the purpose named in 1st and 3d Section of said act, have taken and do hereby take the following described lands situated in Montgomery and Westfield Hampden County Massachusetts and supposed to belong to —

Edward Bancroft

Commencing at a Stake and Stone about 50 feet westerly of Town line between Montgomery and Westfield and in line between Edward Bancroft and the southerly line of old road and running S.31°15'E.310 feet to Stake and Stone in old stone wall, thence S.82°30'E.520 feet to Stake and Stone, thence S.75°E. 230 feet to Stake and Stone in fence on southerly side of highway, The above description is for southerly line of Lands taken and said lands taken include all the land lying northerly between the above described line and the highway, containing two acres and eighteen rods (2 acres 18 rods) more or less.

Also a strip of land across the Highway from last described point S.75°E.54 feet to a Stake and Stone in the northerly line of said Highway. The width of land taken being one rod on each side of above described line containing 7 rods more or less,

The tracing marked "A" hereto annexed is hereby made a part of this description, ing "B."


Needle Variation = 9°04' W.
Scale: 200 Ft.= 1 inch
Magnetic Meridian.
Charles Cooley
Charles Cooley.
Barn
Road to Westfarms
Road to Westfield
Highway
S. 49° E.
S. 73° E.
R. 5740
R. 499.4
11°30'
R. 410
14°
10°
44
4+50

Also one certain tract or parcel of land situated in Westfield in said County supposed to belong to Charles Cooley and described as follows.

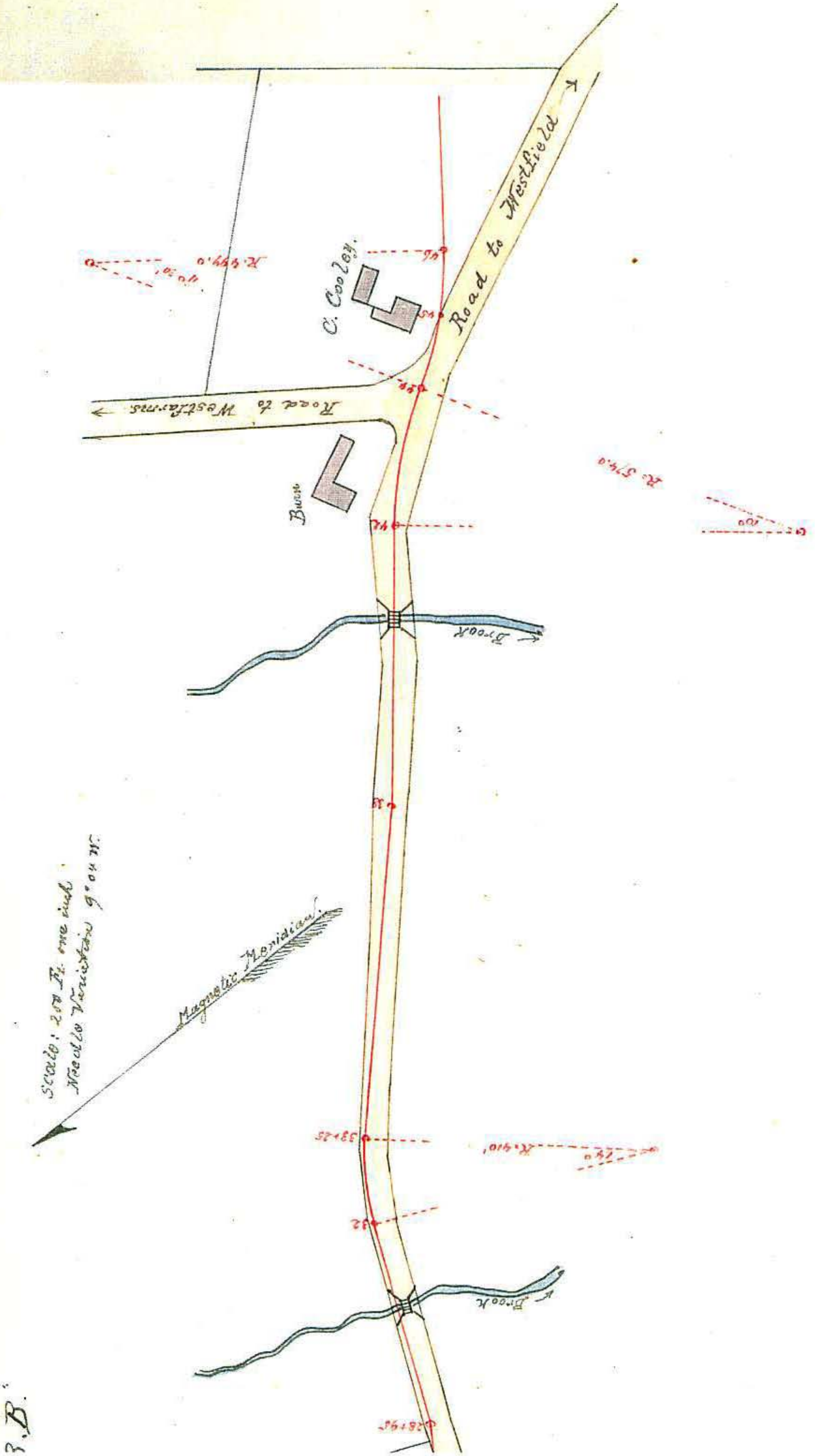
Commencing at a Stake and Stone on the northerly side of highway and running S.75° E. 110 feet, Thence S.49°E 1000 feet to a Stake and Stone on northerly line of said Highway and at corner of lot.

The above description is for the northerly line of lands taken, Said lands taken include all the land lying southerly between the above described line and the Highway containing two acres and fifteen rods (2acres 15 rods) more or less,

Also the following described Tract of land supposed to belong to said Cooley, commencing at Stake and Stone in easterly line of highway about 35 feet southerly from southeasterly corner of said Cooleys dwelling house and running S.53°E. 340 feet to a Stake and Stone in the line between said Cooleys and Dennis Atkins,

The above description is for the centreline of location the width of land taken being one rod on each side of said centreline, meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said centreline containing forty-four rods (44 rods) more or less,

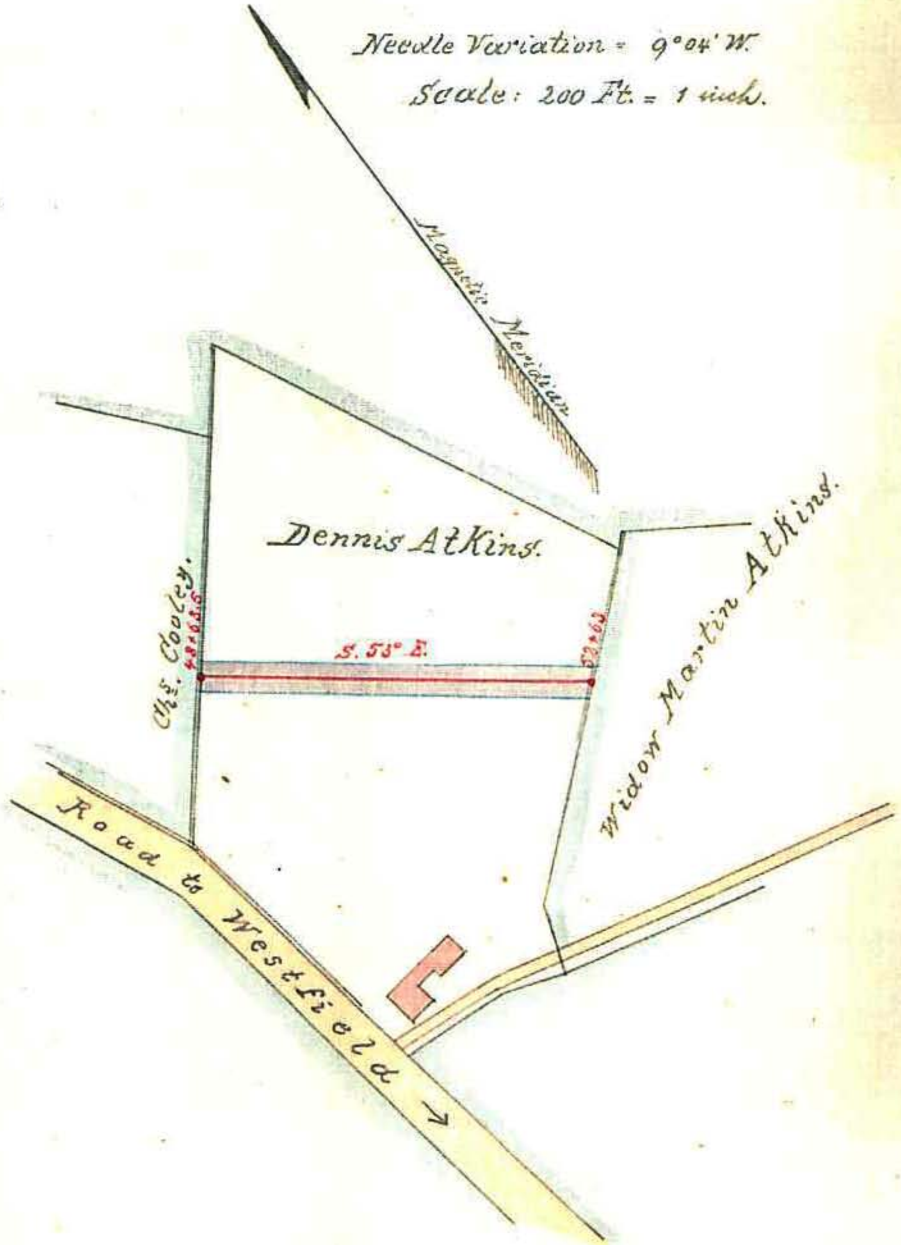
The tracing marked "B" hereto annexed is hereby made a part of this description.


3. "B."
Scale: 200 Ft. one inch
Needle Variation 9°04' W.
Magnetic Meridian.
Road to Westfield
Road to Westfarms.
C. Cooley.
Barn
Brook
Brook
R. 499.0
11°20'
R. 574.0
10°
R. 410'
14°
46
45
44
42
38
33+25
32
28+95

Also the following described Tract of Land, the same being a part of a Highway from Westfield to Montgomery,

Commencing at Sta. 28+31 as shown on tracing marked B.B. hereto annexed a point in the Northerly line of Highway and Southerly line of land of Charles Cooley Jr and running South Easterly along said Northerly line of Highway about 1750 feet to a point about 80 feet Southerly of dwelling House of Charles Cooley Jr, The above description is for the North Easterly side of lands taken and said lands taken include all land lying between the above described line and the South Westerly line of said Highway containing two acres more or less.

Tracing "C."

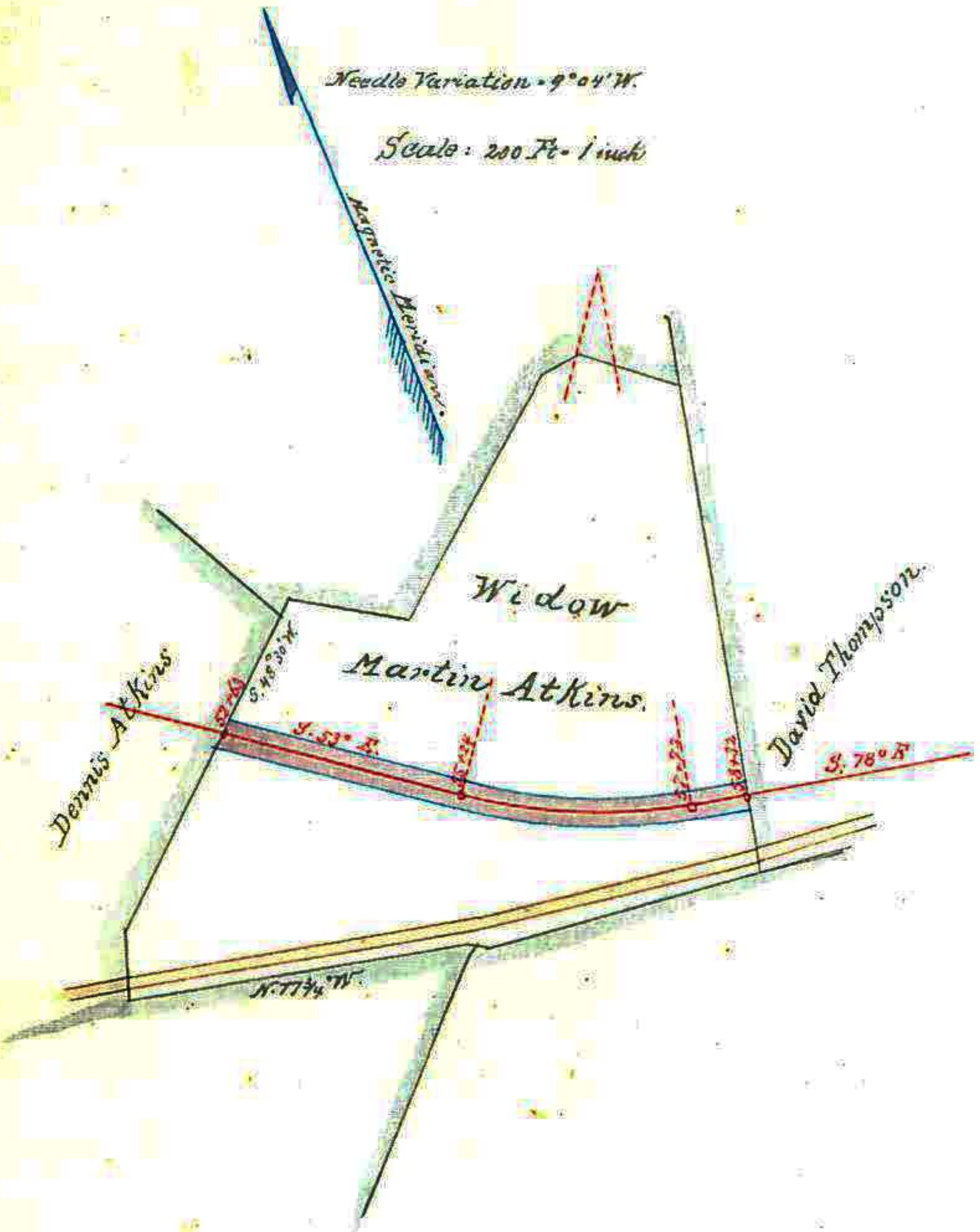

Needle Variation = 9°04' W.
Scale: 200 Ft. = 1 inch.

Also one certain tract or parcel of Land situated in Westfield in said county supposed to belong to Dennis Atkins and described as follows

Commencing at a Stake and Stone in division line between Charles Cooley Jr. and Dennis Atkins Sta. 48+63.5 as shown in tracing marked "C" hereto annexed and running S.53.E. 600 feet to a Stake and Stone Sta 52+63 in division line between Dennis Atkins and Widow Martin Atkins,

The above description is for the centre line of location, the width of land taken being one rod on each side of said centreline, meaning to cover all land lying between said division lines and lines parallel with and one rod right and one rod left of said centreline of location containing forty-one rods (41 Rods) more or less.

Tracing „D.

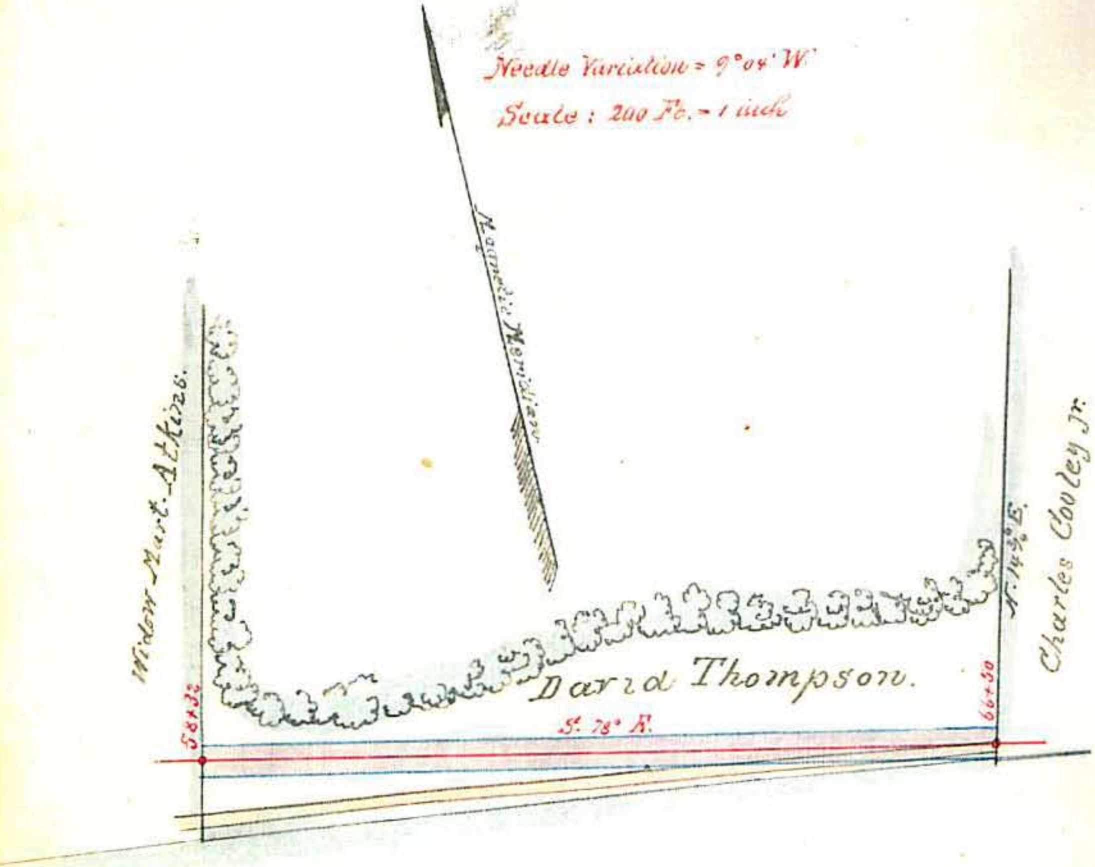

Needle Variation · 9° 04' W.
Scale: 200 Ft. · 1 inch
Magnetic Meridian
Widow
Martin Atkins.
Dennis Atkins
David Thompson.
S. 48° 30' W.
S. 53° E.
S. 78° E.
N. 77¾° W.

Also one certain Tract or Parcel of Land situated in Westfield in said County supposed to belong to Widow Martin Atkins and described as follows.

Commencing at a Stake and Stone in the division fence between Dennis Atkins and the Widow Martin Atkins Sta 52+63 as shown in tracing marked "D" hereto annexed and running S. 53.° E a distance of 261 feet to a Stake and Stone at Sta. 55+24 the commencement of a 10° curve (Rad 574 ft.) to the left or northerly, thence on said curve a distance of 253 feet to Sta. 57+77 the end of said curve, thence on tangent course S. 78.° E. 55 feet to Sta 58+32 a point in division fence between Widow Martin Atkins and David Thompson.

The above description is for the centre line of location, the whole length on centre being 569 feet, the width of land taken being one rod on each side of said centre line meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said centre line of location containing seventy-six rods (76 rods) more or less.

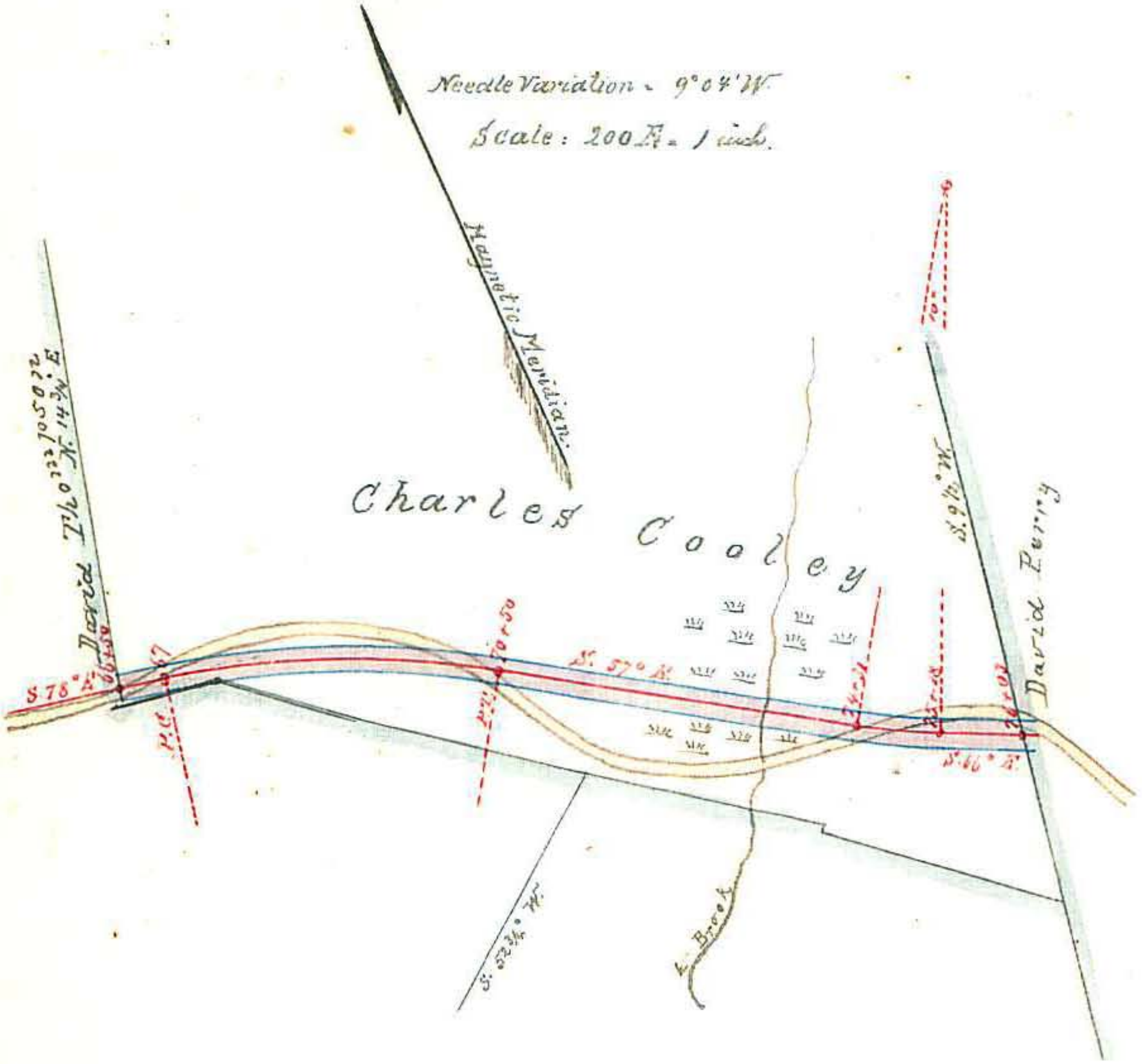
Tracing. "E."


Needle Variation = 9°04' W.
Scale : 200 Ft. = 1 inch
Magnetic Meridian
Widow Mart. Atkins.
David Thompson.
Charles Cooley Jr.
N. 14¾° E.
S. 78° E.
58+32
66+50

Also one certain Tract or Parcel of Land, situated in Westfield in said county supposed to belong to David Thompson and described as follows, Commencing at a Stake and Stone in division fence between Widow Martin Atkins and David Thompson Sta 58+32 as shown in tracing marked "E" hereto annexed and running S 78° E 818 feet to a Stake and Stone at Sta 66+50 in division fence between David Thompson and Charles Cooley Jr.

The above description is for the centre line of location, the width of land taken being one rod on each side of said centre line, meaning to cover all land lying between said division lines and lines parallel with and one rod right and one rod left of said centre line containing ninety-nine rods (99 Rods) more or less.

Tracing "F".


Needle Variation = 9° 04' W.
Scale: 200 Ft. = 1 inch.
Magnetic Meridian.
Charles Cooley
David Thompson
N. 14¾° E
S. 78° E
P.C.
P.T. 70+50
S. 57° E.
S. 66° E.
10°
S. 9½° W.
David Perry
S. 52¾° W.
Brook

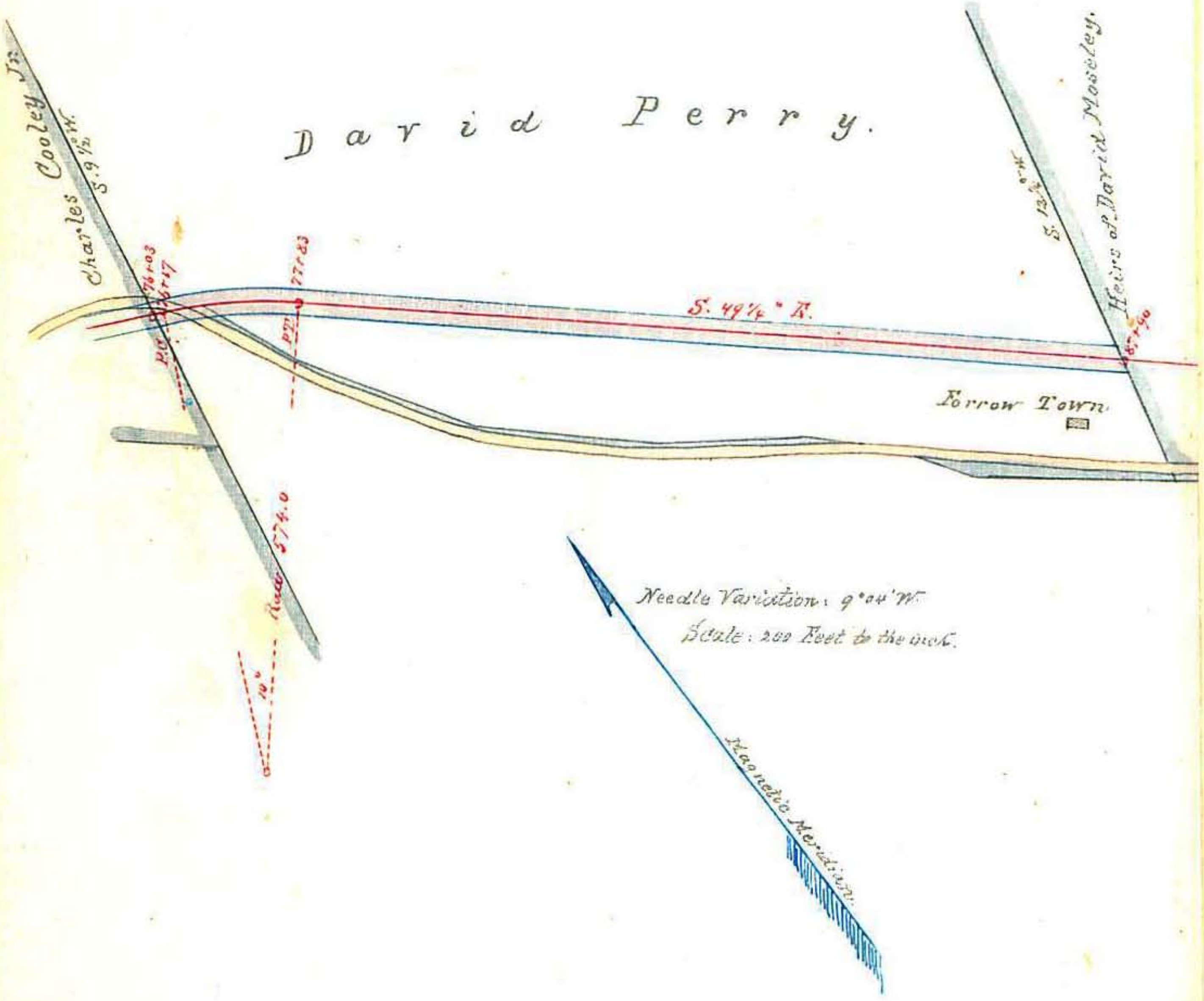
R.=455.0

Also one certain Tract or Parcel of Land situated in Westfield in said County supposed to belong to Charles Cooley Jr and described as follows,

Commencing at a Stake and Stone in the division Fence between David Thompson and Charles Cooley Jr Sta. 66+50 as shown in tracing marked "F" hereto annexed and running S 78° E 50 feet to a Stake and Stone at Sta. 67 the commencement of a 6° curve (Rad's 955 ft) to the right or southerly, Thence on said curve a distance of 350 feet to Sta. 70+50 the end of said curve, Thence on tangent course S 57° E to Sta. 74+31. 381 feet to a Stake and Stone the commencement of a 10° curve (Rads 574 ft) to the left or northerly, Thence on said curve a distance of 87 feet to Sta. 75+18 the end of said curve, Thence on tangent course S. 66° E. 85 feet to Sta. 76+03 a point in division fence between Charles Cooley Jr and David Perry.

The above description is for the centre line of location the whole length on centre being 953 feet, The width of land taken being one rod on each side of said centre line meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said centre line of location, containing (115 Rods) one hundred and fifteen rods more or less,

Tracing "G."



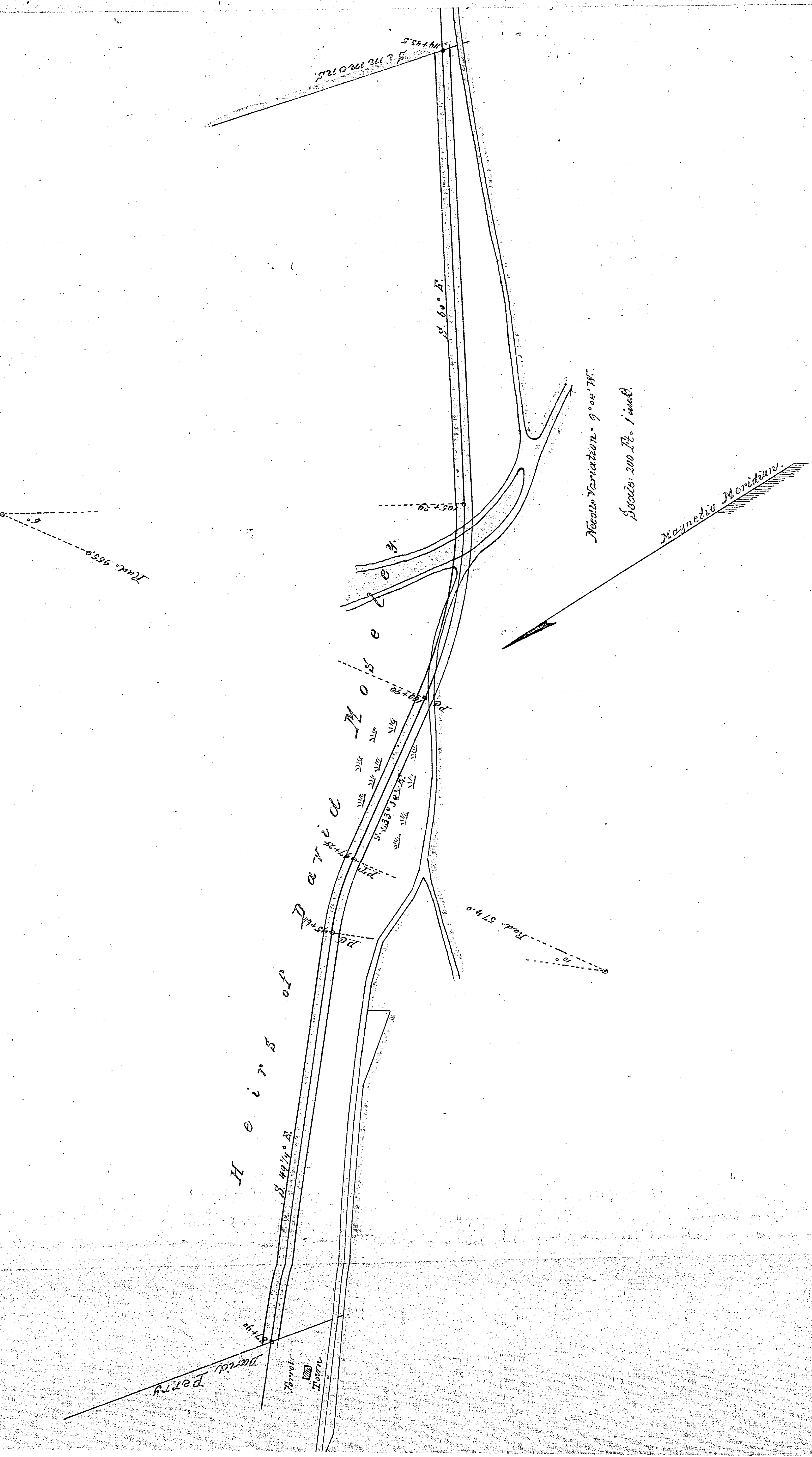
Needle Variation: 9°04' W.
Scale: 200 Feet to the inch.

Also one certain Tract or Parcel of Land situated in Westfield in said County supposed to belong to David Perry and described as follows,

Commencing at a Stake and Stone in the division Fence between Charles Cooley Jr and David Perry Sta. 76+03 as shown in tracing marked "C" hereto annexed and running S 66° E a distance of 14 feet to a Stake and Stone at Sta. 76+17 the commencement of a 10° curve (Rads 574.0) to the right or southerly, Thence on said curve 166 feet to Sta. 77+83 the end of said curve, Thence on tangent course S.49¼° E 1007 feet to Sta. 87+90 a point in division fence between David Perry and Heirs of David Moseley,

The above description is for the centre line of location the whole length on centre being 1187 feet. The width of land taken being one rod on each side of said centre line meaning to cover all land lying between the above described division lines and lines parallel with, and one rod right and one rod left of said centre line of location, containing one hundred and forty-four rods (144 rods) more or less.

Tracing "H."

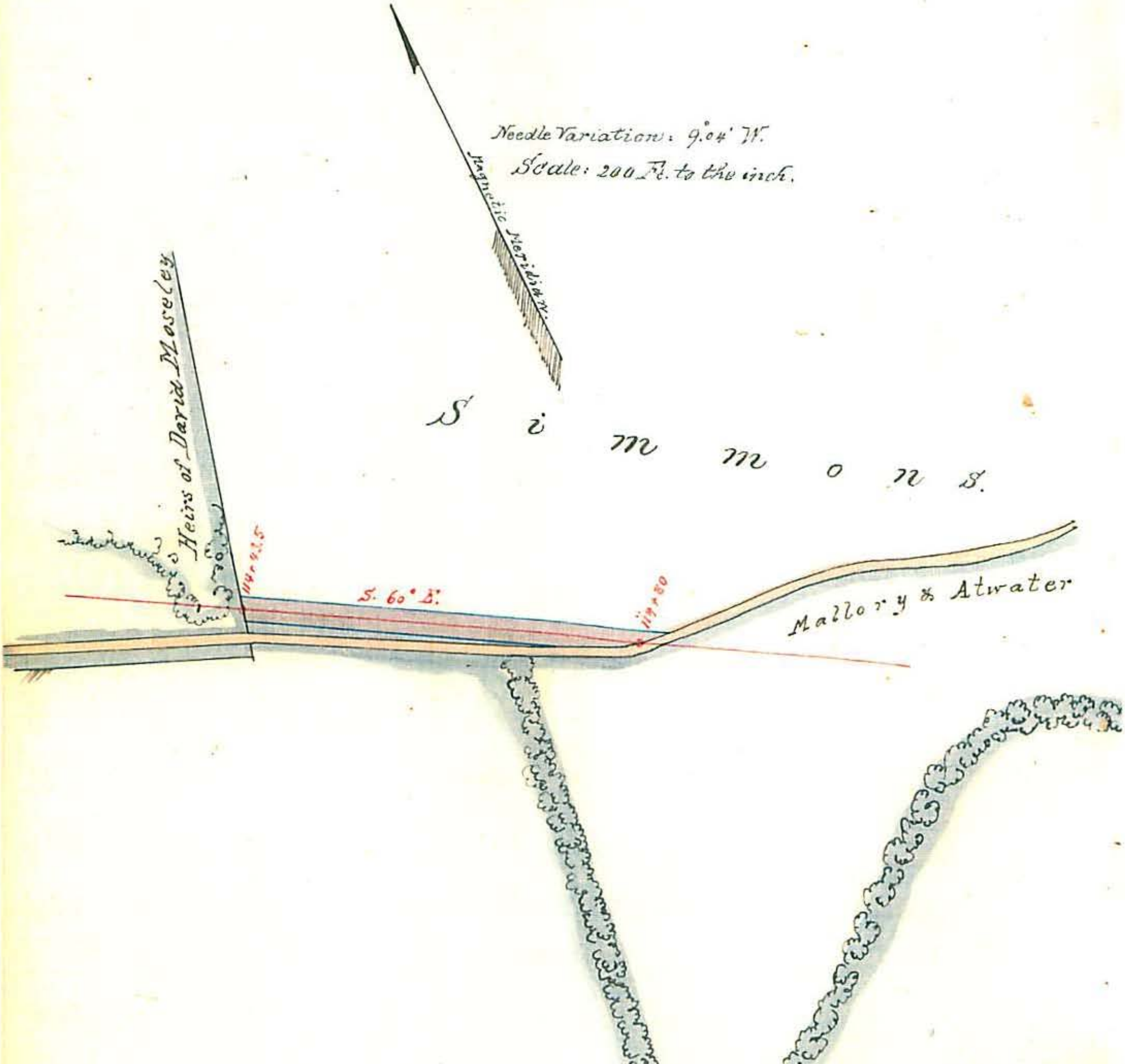

114+43.5
Simmons
S. 60° E.
105+29
6°
Rad. 955.0
Needle Variation 9° 04' W.
Scale: 200 Ft. 1 inch.
Magnetic Meridian.
Heirs of David Moseley.
PC 100+90
S. 33° 30' E.
PT 97+24
PC 95+68
Rad. 574.0
10°
S. 49 1/4° E.
87+90
David Perry
Terrace
Town

Also one certain Tract or Parcel of Land situated in Westfield in said County supposed to belong to Heirs of David Moseley and described as follows,

Commencing at a Stake and Stone in the division Fence between David Perry and Heirs of David Moseley Sta. 87+90 as shown in tracing marked "H" hereto annexed and running S49¼'E 776 feet to a Stake and Stone at Sta. 95+66 the commencement of a 10° curve (Rads 574') to the right or southerly, Thence on said curve a distance of 158 feet to Sta 97+24 the end of said curve, Thence on tangent course S33°30'E 366 feet to Stake and Stone at Sta 100+90 the commencement of a 6° curve (Radius 955 ft) to the left or northerly, Thence on said curve a distance of 439 ft to Sta. 105+29 the end of said curve, Thence on tangent course S68°E 914.5 ft to Sta. 114+43,5 a point in division fence between Heirs of David Moseley and Simmons,

The above description is for the centre line of location the whole length on centre being 2653.5 feet; The width being one rod on each side of said centre line meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said centre line of location containing two acres and two rods (2 Acres 2 Rods) more or less

Tracing "I."



Needle Variation: 9°04' W.

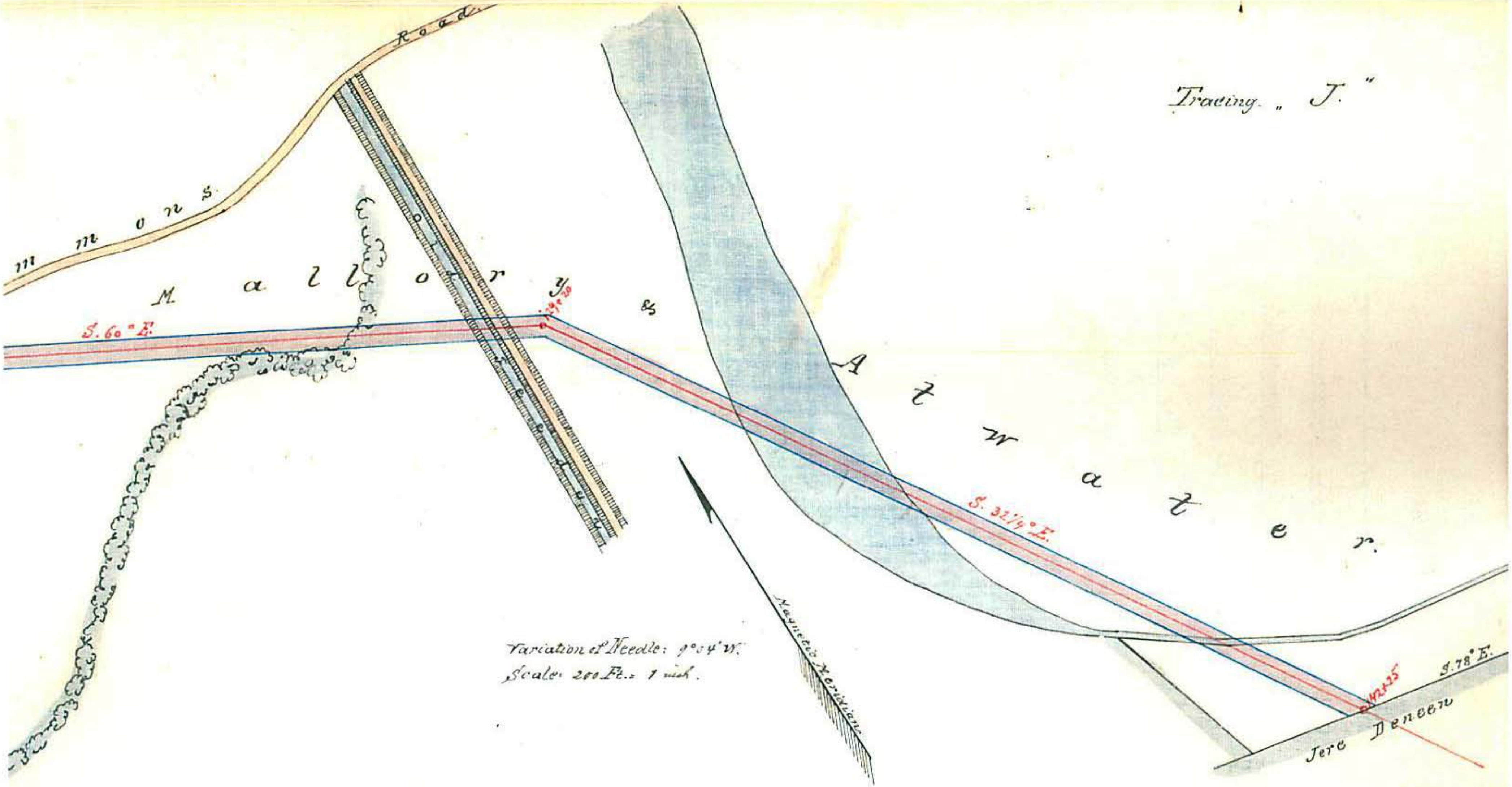
Scale: 200 Ft. to the inch.

Also one certain Tract or Parcel of Land situated in Westfield in said County, supposed to belong to ________ Simmons and described as follows,

Commencing at Stake and Stone in division Fence between Heirs of David Moseley and   Simmons Sta. 114+43.5 as shown on tracing marked "I" hereto annexed and running S 60°E 536.5 feet to Sta. 119+80 a point in division fence between said   Simmons and Malloy & Atwater,

The above description is for the centre line of location, the whole length on centre line being 536.5 feet, The width of land taken being one rod on each side of said centre line, meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said centre line of location, Containing six-five rods (65 Rods) more or less,

Tracing „ J."



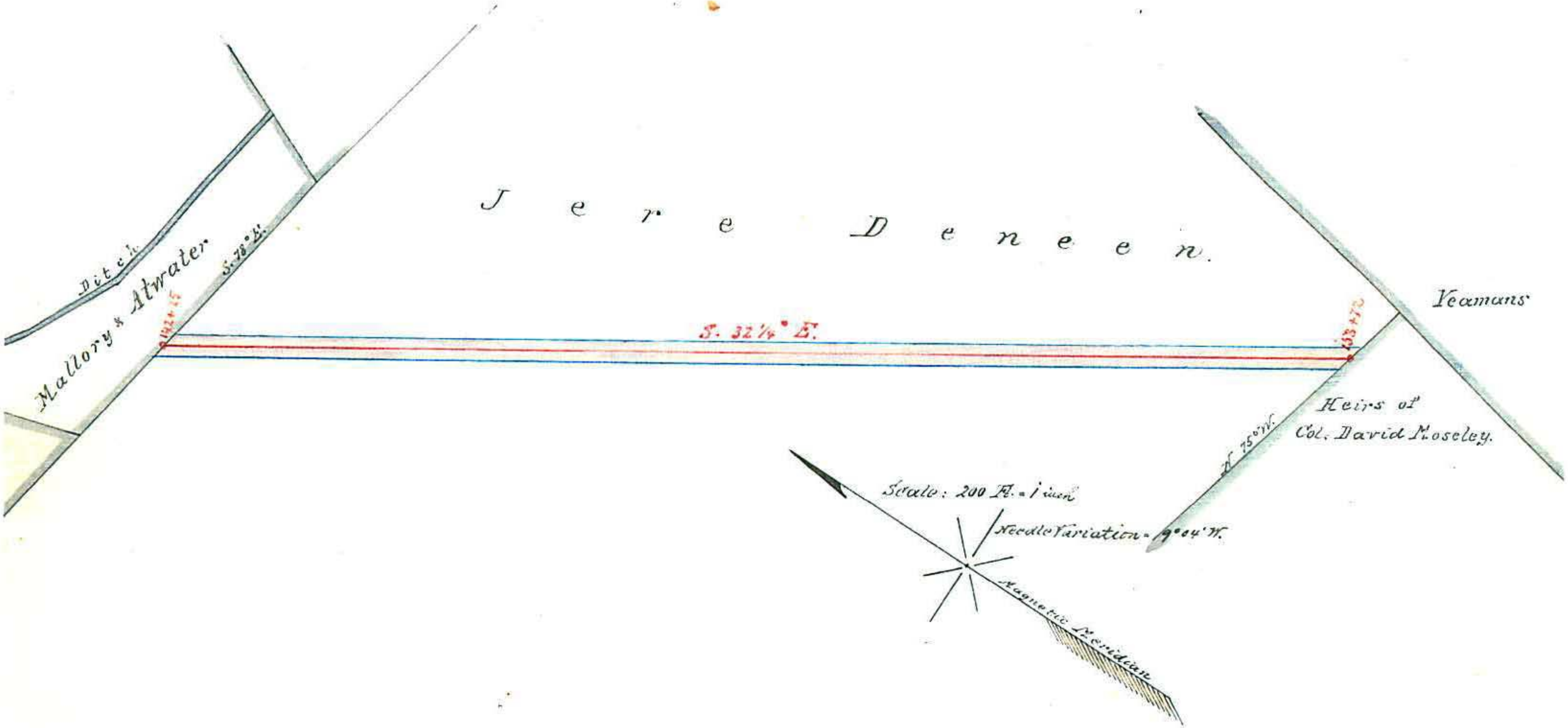
Variation of Needle: 9°04' W.
Scale: 200 Ft. = 1 inch.

Also one certain Tract or Parcel of Land situated in Westfield said county supposed to belong to Mallory and Atwater and described as follows.

Commencing at a Stake and Stone in the division Fence between Simmons and Mallory and Atwater Sta. 119+80 as shown in tracing marked "J" hereto annexed and running S. 60° E. 920 feet to a Stake and Stone at Sta 129+20. Thence running S 32¼° E 1325 feet to Sta. 142+25 a point in division fence between Mallory and Atwater and Geo Dineen,

The above description is for the centre line of location the whole length on centre being 2245 feet, The width of land taken being one rod on each side of said centre line meaning to cover all land lying between the above described division lines and line parallel with and one rod right and one rod left of said centre line of location, containing one acre one hundred and twelve rods more or less

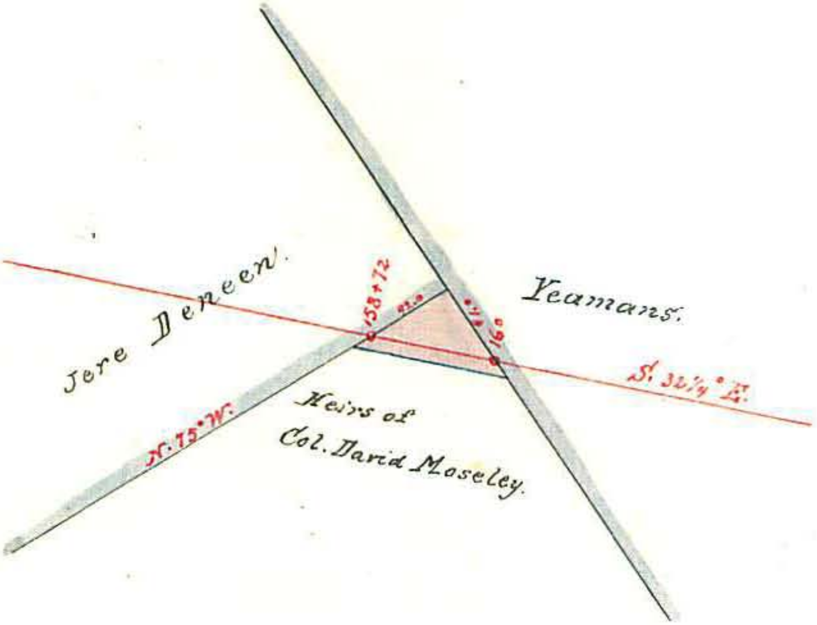
Tracing "K".

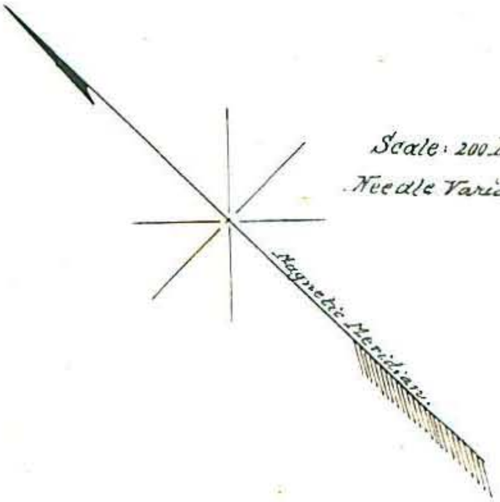

Jere Deneen.
Mallory & Atwater
Ditch
S. 78° E.
142+15
S. 32¼° E.
153+72
Yeamans
Heirs of
Col. David Moseley.
N. 75° W.
Scale: 200 Ft. = 1 inch
Needle Variation = 9° 04' W.
Magnetic Meridian

Also one certain Tract or Parcel of Land situated in Westfield in said County supposed to belong to Jire Deneen and described as follows.

Commencing at a Stake and Stone in the division Fence between Mallory and Atwater and Jire Deneen Sta. 142+25 as shown on tracing marked K hereto annexed and running S32¼°E 1647 feet to Sta. 158+72 a point in division fence between Jire Deneen and Heirs of Col. David Moseley.

The above description is for the centre line of location the whole length on centre being 1647 feet. The width of land taken being one rod on each side of said centre line meaning to cover all land lying between the above described divisions lines and lines parellel with one rod right and one rod left of said centre line of location. Containing one acre thirty-nine rods (1 Acre 39 Rods) more or less.





Scale: 200 Ft. = 1 inch.

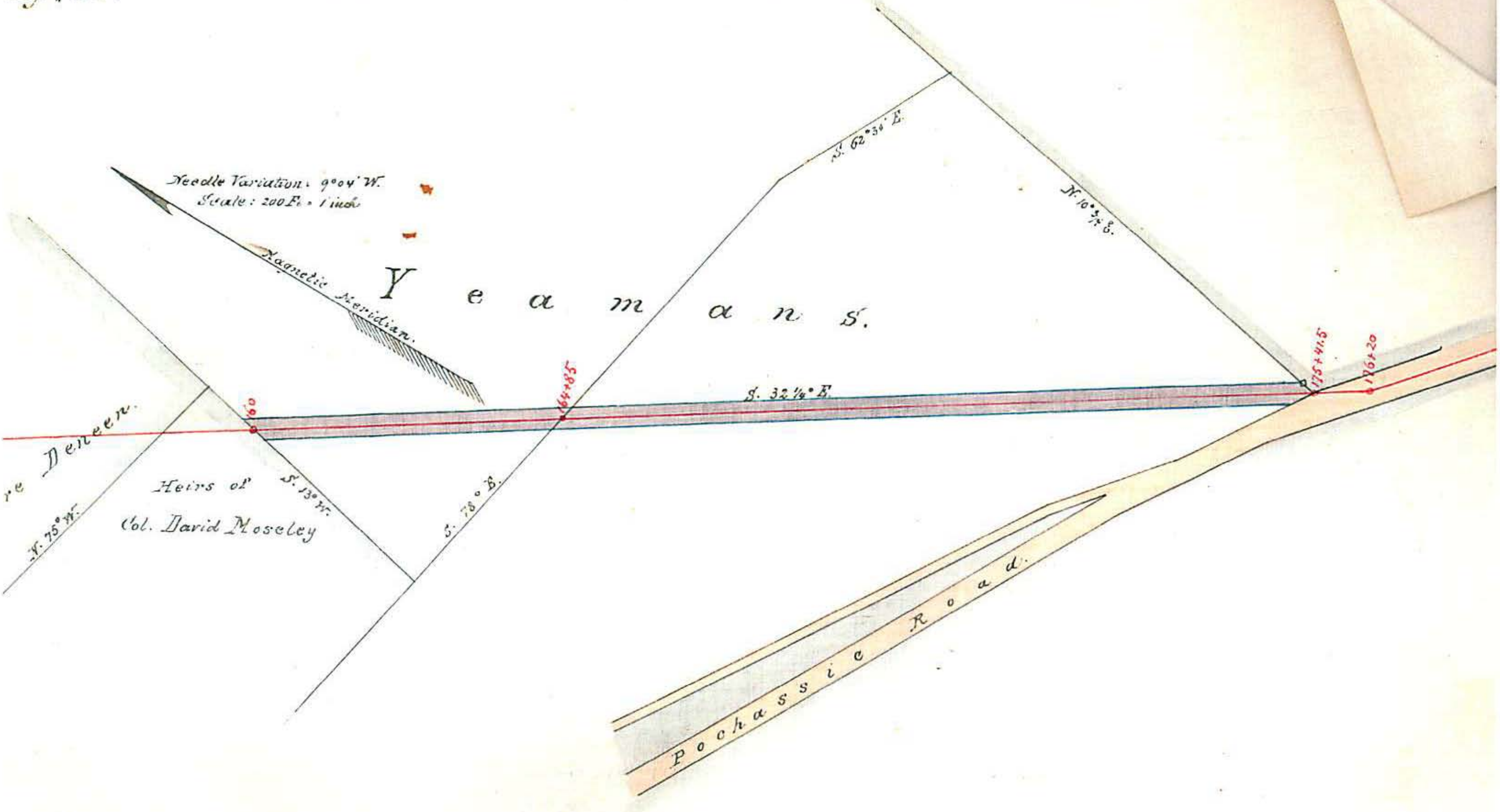
Needle Variation: 9° 04' W.

Also, one certain Tract or Parcel of land situated in Westfield in said County supposed to belong to Heirs of Col. David Moseley and described as follows,

Commencing at a Stake and Stone in the division fence between Jere Denun and Heirs of Col. David Moseley Sta. 158+72 as shown on tracing marked "I" hereto annexed and running S 32¼° E 128 feet to a Stake and Stone Sta. 160 a point in division fence between Heirs of Col David Moseley and Yeamans,

The above description is for the centre line of location the whole length on centre line being 128 feet, the width of land taken being one rod to the right or southerly and all the land to the left or northerly of said centre line to lands of Yeamans and Jere Denun, containing twenty three rods (23 Rods) more or less.

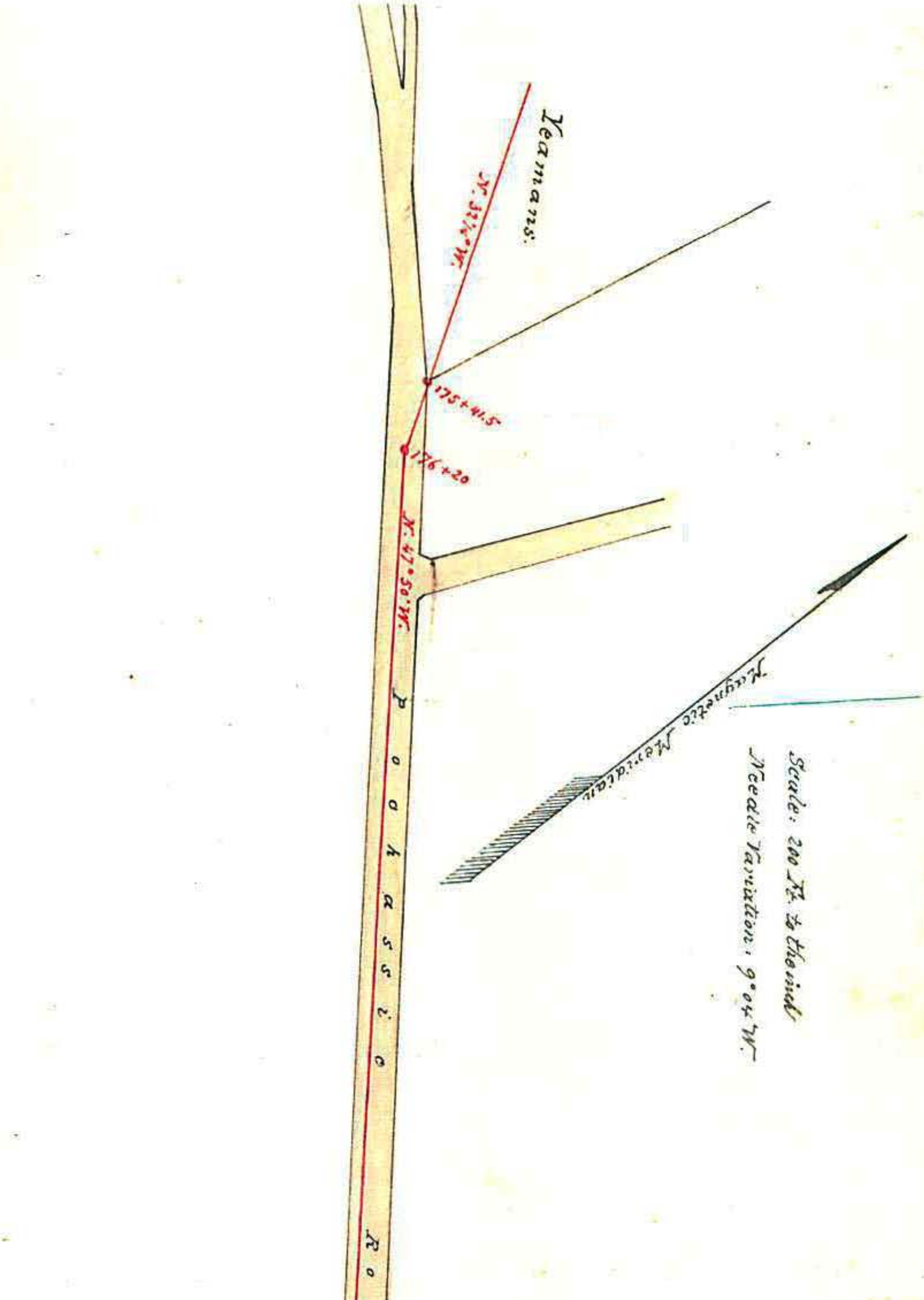
ing. „M.


Needle Variation: 9°04' W.
Scale: 200 Ft. = 1 inch
Magnetic Meridian.
Yeamans.
re Deneen.
N. 75° W.
Heirs of
Col. David Moseley
S. 13° W.
S. 78° E.
S. 62°30' E.
N. 10°3/4 E.
S. 32 1/4° E.
160
164+85
175+41.5
176+20
Pochassic Road.

Also one certain Tract or Parcel of Land situated in Westfield in said County supposed to belong to ______ Yeamans and described as follows,

Commencing at a Stake and Stone in the division fence between Heirs of Col. David Moseley and Yeamans Sta. 160, as shown in tracing marked "M" hereto annexed and running S 32 1/4° E 1541.5 feet to a Stake and Stone at Sta. 175+41.5 a point in the northerly line of Pochassic Road,

The above description is for the centre line of location the whole length on centre being 1541.5 feet, the width of land taken being one rod on each side of said centre line meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said centre line of location, Containing one acre twenty-six rods (1 acre 26 rods) more or less,


Yeamans.
N. 32½° W.
175+41.5
176+20
N. 47°50' W.
Poohassic Road
Magnetic Meridian
Scale: 200 Ft. to the inch
Needle Variation: 9°04' W.
187+29.5
189+02
Patrick Hines

Also the following described Tract or Parcel of land, said Tract being a part of a Highway in the Town of Westfield known as,

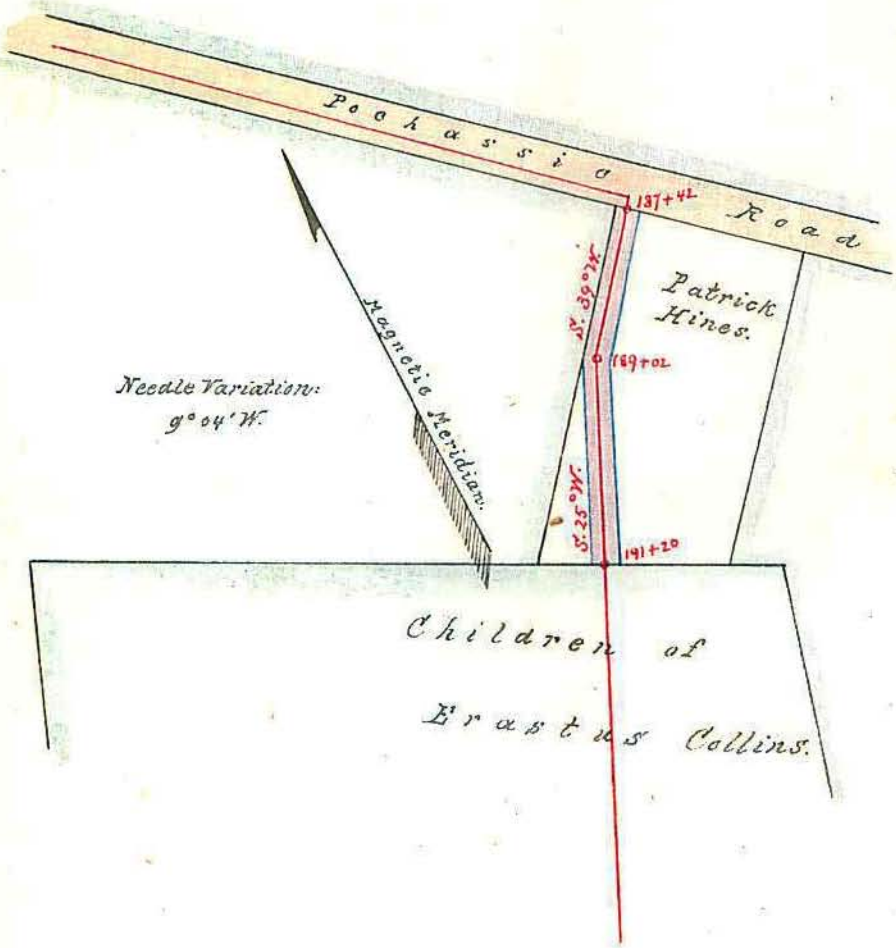
Pochassic Road.

Commencing at a point in Northerly lines of said road and three rods westerly of Yeamans easterly line and running on said northerly line of Street to a point three rods easterly of Patrick Hines westerly line a distance of about 1288 feet.

The above description is for the northerly line of location, the land taken includes all the land southerly of said line to the southerly line of Highway.

The tracing marked "M.M." hereto annexed is hereby made a part of this description.

Tracing "N."



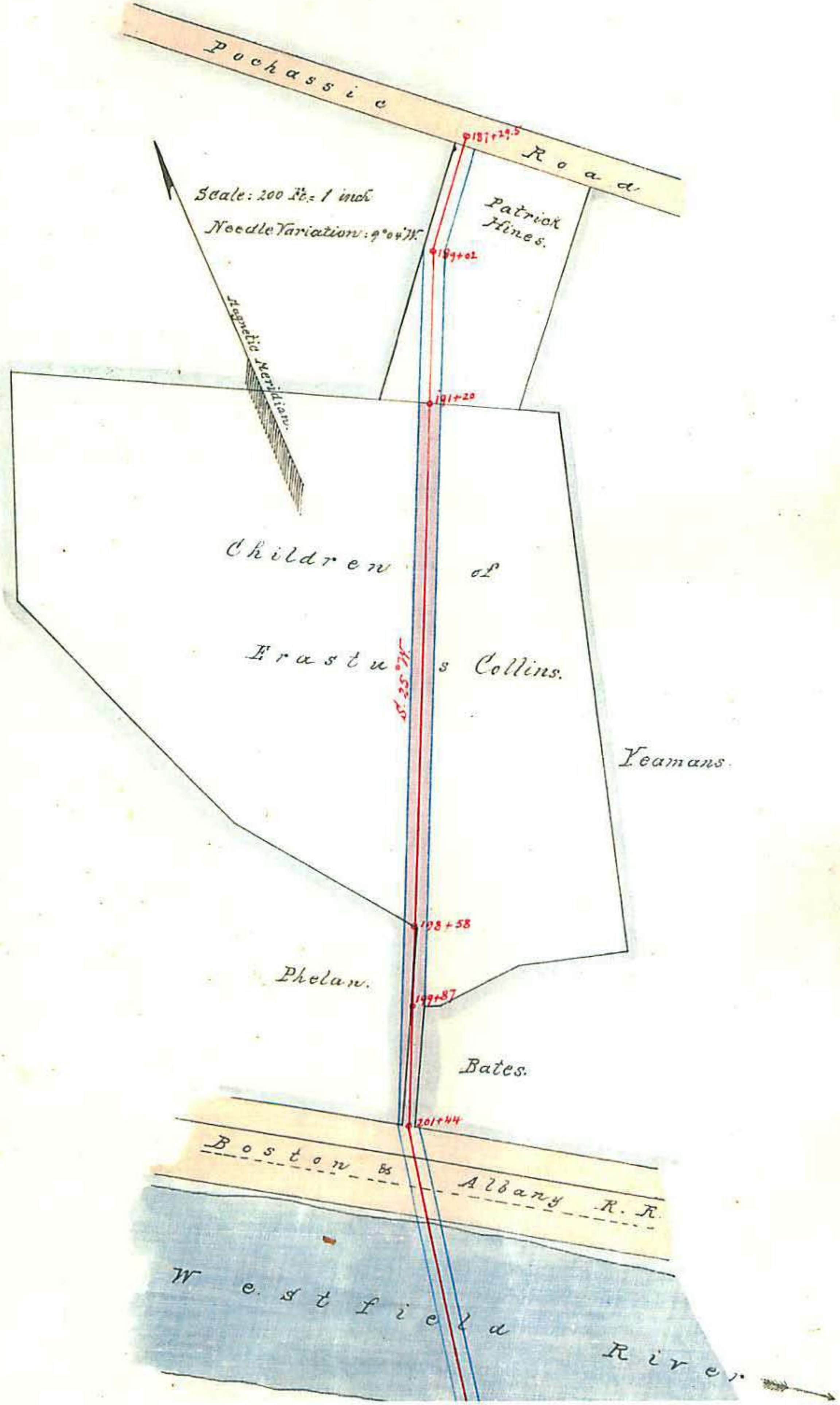
Scale: 200 Ft.= 1 inch.

Also one certain Tract or Parcel of land situated in Westfield in said County supposed to belong to Patrick Hines and described as follows

Commencing at a Stake and Stone in the southerly line of Pochassic Road and in Northerly line of Patrick Hines lot and one rod easterly of line between said Hines and Mrs Reagan at Sta. 187+40 as shown on tracing marked. N hereto annexed and running S 39° W 162 feet to Stake and Stone at Sta 189+02, Thence S 25° W 210 feet to Sta 191+12 a point in division fence between Patrick Hines and Erastus Collins. Children

The above description is for the centre line of location the whole length on centre being 372 feet, the width of land taken being one rod on each side of said centre line meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said centre line of location containing forty-five rods (45 Rods) more or less

Tracing. O."


Pochassic Road
187+29.5
Scale: 200 Ft. = 1 inch
Needle Variation: 9°04' W.
Patrick Hines.
189+02
Magnetic Meridian.
191+20
Children of Erastus Collins.
S. 25° W.
Yeamans.
198+58
Phelan.
199+87
Bates.
201+44
Boston & Albany R. R.
Westfield River.

Also one certain Tract or Parcel of land situated in Westfield in said County and supposed to belong to Erastus Collins' Children and described as follows,

Commencing at a Stake and Stone in division line between Patrick Hines and said Collins, Children at Sta. 191+20 as shown on tracing marked „O" hereto annexed and running S 25° W about 1024 feet to a point in the northerly line of Pochassic St. and 8½ feet Westerly of Bates S.W. corner, The above description is for the centre line of location, the width of land taken being one rod on each side of said Centre line excepting from Sta 199+87 a point at right angles to and one rod westerly of Bates N.W. corner to Pochassic St., The land taken is bounded on the left or easterly by Bates west line, The width on the right or westerly being one rod, Meaning to cover all land above described supposed to belong to Collins Children not covered by the description of land taken from John and Elisha Phelan, containing 106 Rods more or less,

Also one certain Tract or Parcel of land situated in Westfield in said County supposed to belong to John + Elisha Phelan and described as follows,

Commencing at a Stake and Stone in the division line between said Phelan + Collins Children at Sta 198+58 as shown in Tracing marked „O" hereto annexed and running S 25° W 286. feet to Sta 201+44 a point in the northerly line of Pochassic St. and 8½ feet westerly of Bates west line, The above description is for the centre line of location, The land taken lying partly on the right or westerly + partly on the left or easterly and includes all lands supposed to belong to said Phelans between above named Stations and a line one rod Westerly of said Centre line and easterly to supposed lands of Collins Children as above described

Also one certain Tract or Parcel of land situated in Westfield in said County supposed to belong to the Boston & Albany RR and described as follows,

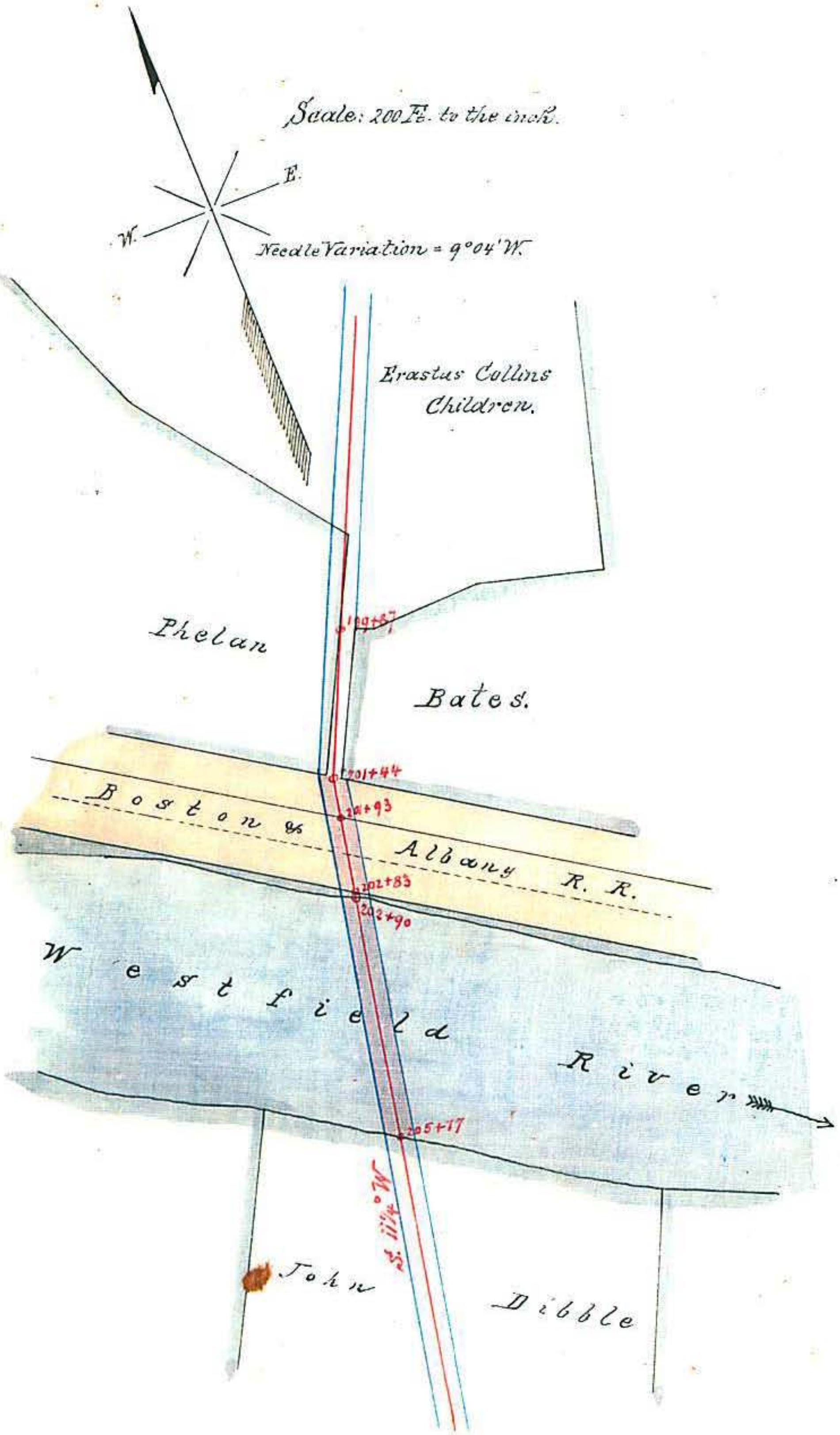
Commencing at a point in the northerly line of location of said B & A RR at Sta 201+93 as shown on tracing marked "P" hereto annexed and running S 11¼° W 90 feet to the southerly line of said RR location at Sta, 202+90 the width of land taken being one rod each side of said centre line meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said centre line of location, containing twelve rods (12 Rods) more or less,

Also one certain Tract or Parcel of land situated in Westfield in said county supposed to belong to Samuel Horton and described as follows,

Commencing at a point at the southerly line of B. & A. RR location at Sta 202+83 and running S 11¼ W to the North side of Westfield River a distance of about 10 feet meaning to cover all land lying between the southerly line of the B. & A. R.R. location and the Westfield River and one rod right and one rod left of above described line, supposed to belong to Samuel Horton containing one and one half rods more or less,

Also from last named point across the Westfield River to land of John Dibble a distance of about 287 feet, The width of land taken being one rod each side of above described line,

Tracing "P"


Scale: 200 Ft. to the inch.
E.
W.
Needle Variation = 9°04' W.
Erastus Collins Children.
Phelan
199+87
Bates.
201+44
201+93
Boston & Albany R. R.
202+83
202+90
Westfield River
205+17
N. 11°47' W.
John Dibble

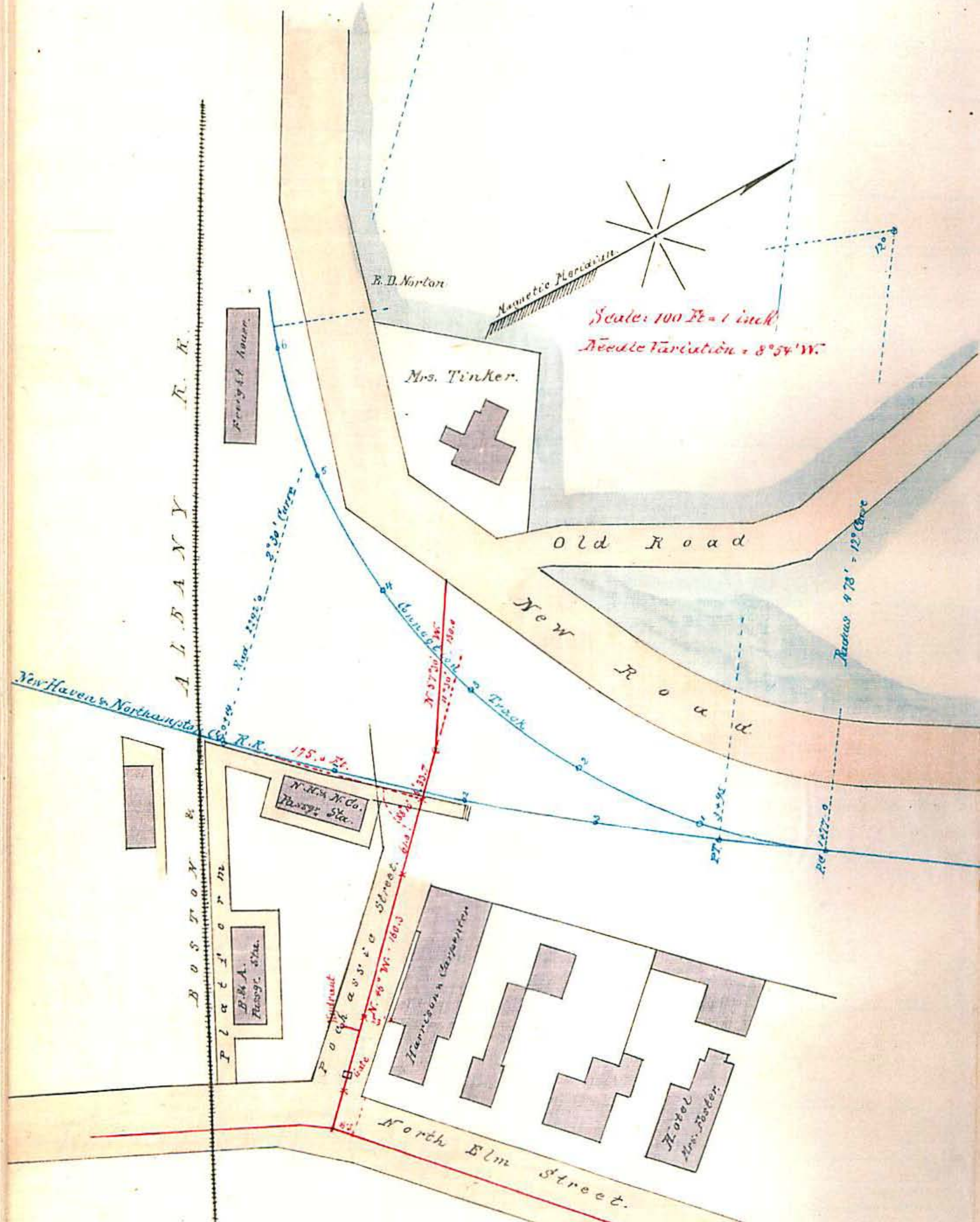
Also one certain Tract or Parcel of land situated in Westfield in said County supposed to belong to

John Dibble and described as follows,

Commencing at Stake and Stone at the southerly side of Westfield River at Sta. 205+77 as shown in Tracing marked „R" hereto annexed and running S 11¼° W 543 feet to Stake and Stone in division line between said Dibble and Town of Westfield at Sta. 211+20. The above description is for the centre line of location, The width of land taken being one rod each side of said centre line, - meaning to cover all land lying between the Westfield River and Land belonging to Town of Westfield and lines parallel with and one rod right and one rod left of said centre line containing sixty-six rods (66 Rods) more or less,

Also a Strip of land supposed to belong~~ing~~ to the Town of Westfield from Sta 211+20 to the southerly side of Dyke in Clark Street a distance of about 113 feet same course as last described centre line, The width of land taken being one rod each side of said centre line containing fourteen rods (14 Rods) more or less,

Tracing .. "S."


Magnetic Meridian.
Scale: 100 Ft = 1 inch.
Needle Variation = 8°54' W.
12°
R. D. Norton
Mrs. Tinker.
Freight house.
BOSTON & ALBANY R.R.
New Haven & Northampton Co. R.R.
Old Road
New Road
Rad. 2292.0 - 2°30' Curve
Connecting Track
Radius 478' = 12° Curve
PT. 3+95
PC. 1277.0
N 57°30' W. 130.0
175.0 Ft.
33.7
38.0
60.0
N.H. & N. Co. Passgr. Sta.
B. & A. Passgr. Sta.
Platform
Pocassic Street.
N. 45° W. 180.3
Hydrant
Gate
Harrison & Carpenter.
Hotel Mrs. Foster.
North Elm Street.

Location across New Haven & Northampton Co. R.R.

Commencing at an Iron monument on the westerly line of Holyoke and Westfield R.R. location and in Easterly line of New Road as built by N.H. & N. Co and running S 57°30' E 130 feet to a point 33 7/10 feet westerly of centre line of N.H. & N. Co Main Track, Thence S 46° E about 67 feet to the easterly line of H. & W. R.R. Location, The last described line crosses a Tangent produced from P.C. 14 feet North of North Rail of Boston & Albany R.R. at a distance of 175 feet northerly from said North Rail and six feet easterly of centre line of Main Track of N.H. & N. Co, The included angle of the tangent lines and line of location running westerly as shown on Tracing is 88°10' - The above description is for the centre line of location the width of land taken being one Rod on each side of said centre line containing 24 rds more or less.

Also commencing at the easterly line of R.R. location above mentioned and running about 160 feet course S 46° E same as last course above described to the westerly line of North Elm Street; The above description is for the centre line of location the width of land taken being one rod each side of said centre line containing twenty Rods (20 rods) more or less.

The tracing marked "S" hereto annexed is hereby made a part of this description.

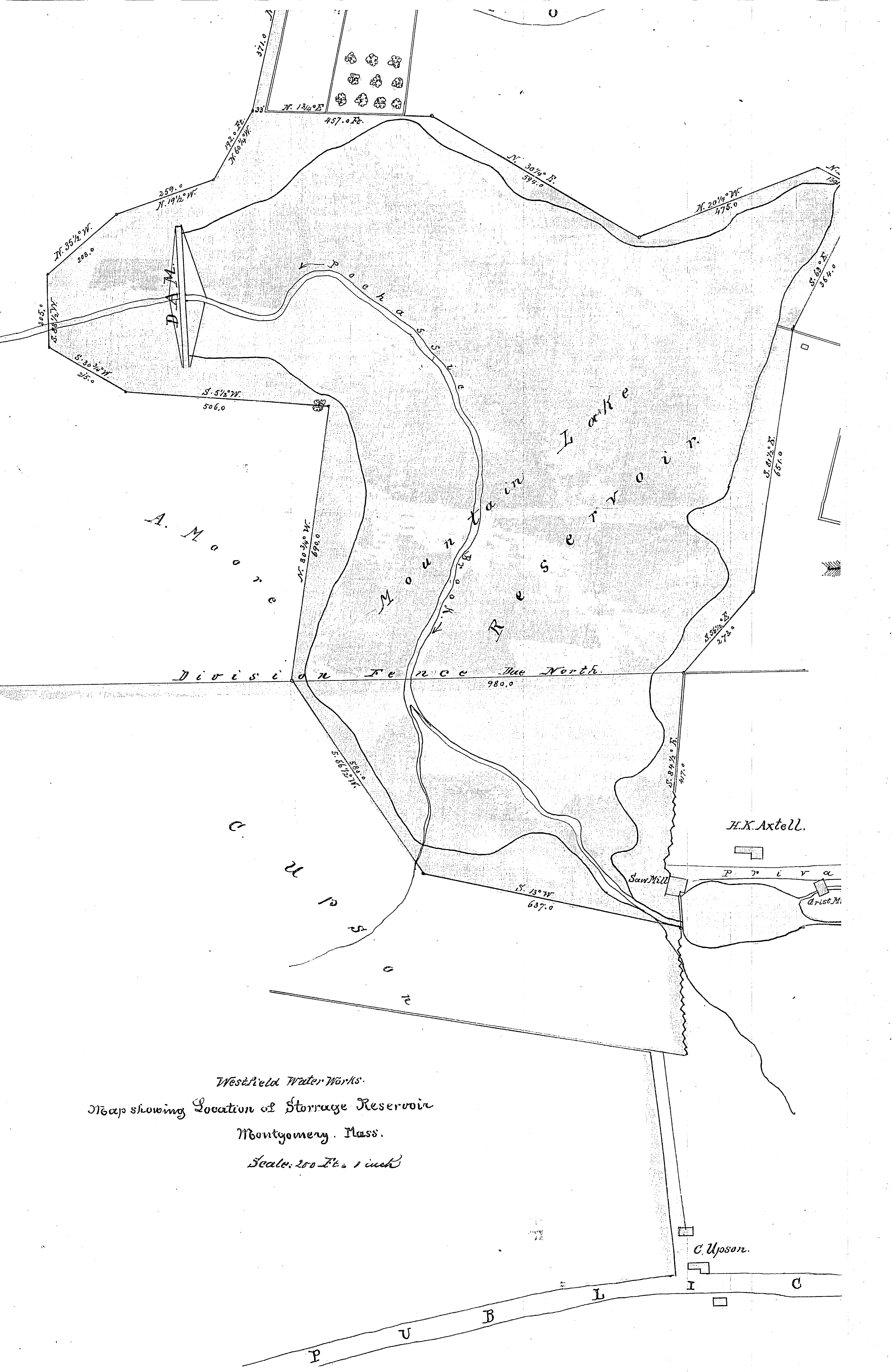
The foregoing Plans and Descriptions are to the best of my knowledge and belief a correct Description of Lands taken for Westfield Water Works.

L. H. Root Eng.

Westfield July 11th 1874.

Reuben Noble
Lewis R Norton
Chas. N. Yeamans
Wm S Bush
Saml Horton

Water Commissioners
for the
Town of Westfield

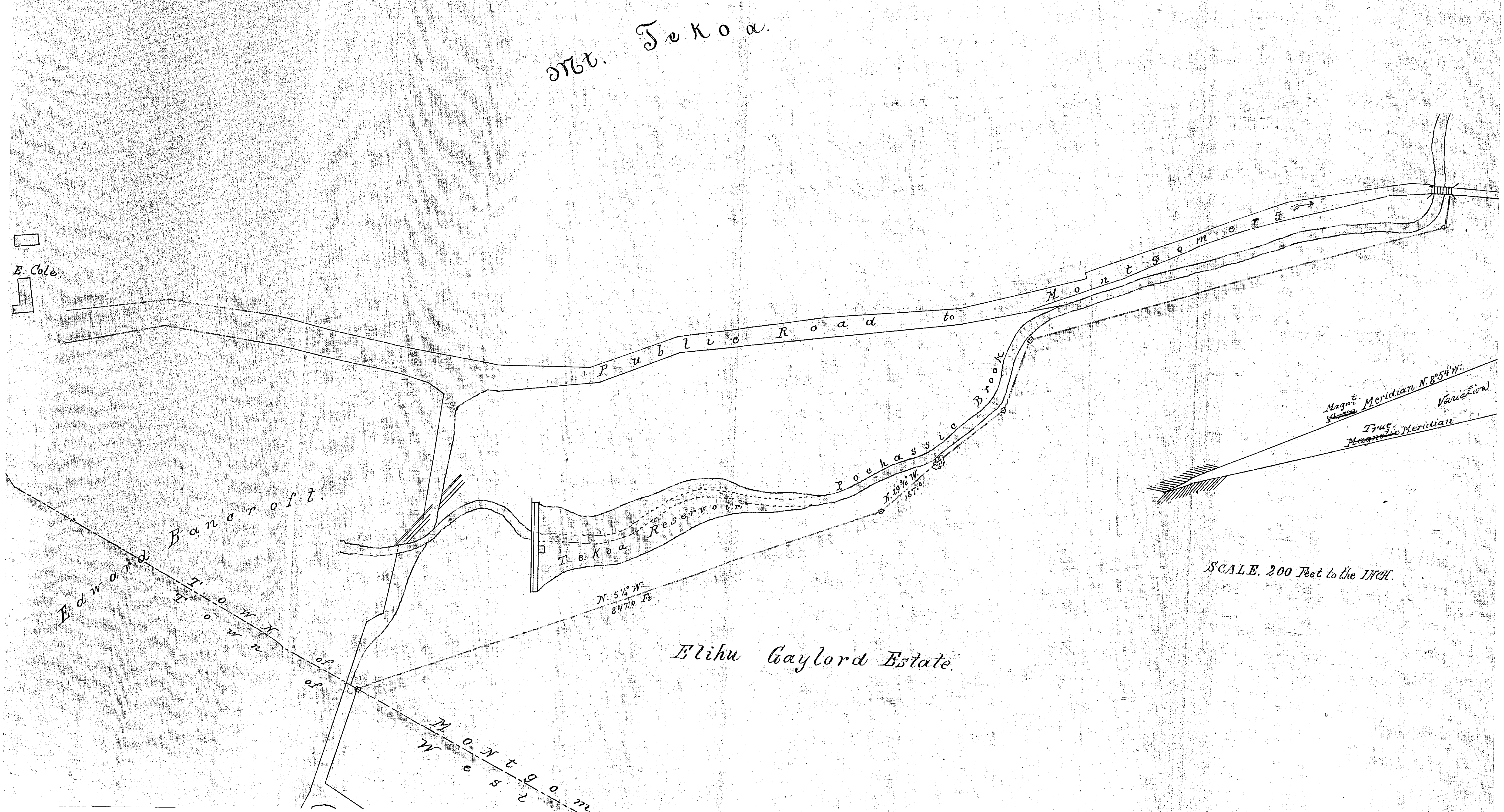


Westfield Water Works.

Map showing Location of Storrage Reservoir

Montgomery. Mass.

Scale: 200 Ft. = 1 inch


Mt. Tekoa.
E. Cole.
Public Road to Montgomery
Pochassic Brook
N. 29¾° W. 187.0
Tekoa Reservoir
N. 5¼° W. 847.0 Ft.
Edward Bancroft.
TOWN of
Town of
Montgom
West
Elihu Gaylord Estate.
Magnt. ~~True~~ Meridian N. 8°54' W.
Variation
True ~~Magnetic~~ Meridian
SCALE. 200 Feet to the INCH.

For Description of Tracings opposite, see Hampden County Register of Deeds Book 308 Page 346.

L P Root Eng.

Received July 18th 1874 and Filed with Hampden County Deeds

Attest James E. Ruſsell Register

The town of Westfield in accordance with the authority given by an Act of the Legislature of Massachusetts entitled "An act to supply the town of Westfield with pure Water" Approved May 29th 1873. and for the purposes named in the 1st and 3d sections of said Act. have taken and do hereby take the following described land situate in Montgomery. Hampden County, Massachusetts. said land lying southeasterly of the Dwelling house of Oliver A. & Octerlony Moore and Southwesterly of the dwelling of H. F. Moore and supposed to belong to Oliver A. Moore & H. F. Moore.

Starting at an iron monument in the stone wall about seventy feet westerly of brook & on the southerly side of Highway leading from Oliver A. Moore's house to H. F. Moore's house. thence running S. 86° E. 118 feet to iron monument by bar post. thence S. 4° W. 140 feet to iron monument. thence S. 6° 30' E. 567 feet to iron monument. thence S. 7° 30' W. 415 feet to iron monument, to land of David Trask. thence westerly along the division line between lands of H. F. Moore & David Trask about 70 feet. to stake & stones. (This last monument is the one described in a former instrument made by the town of Westfield and recorded in said Hampden County Registry of Deeds Book 308 page 346) thence westerly along the face of dam and mill and on the line of an irregular fence to an iron monument near bar-way of a traveled way. being about 270 feet westerly of the last mentioned monument. thence N. 17° E. 560 feet to iron monument. thence N. 6° E. 200 feet to iron monument. thence N. 2° 30' W. 75 feet to iron monument. thence N. 6° 30' E. 300 feet. to place of starting.

The last two courses are along the westerly side of stone wall. The above described land is bounded northerly by the highway Easterl by land of Horace T. Moore. Southerly by land of David Trask & the town of Westfield and westerly by land of Oliver A. Moore. & contains 5 acres & 100 rods more or less.

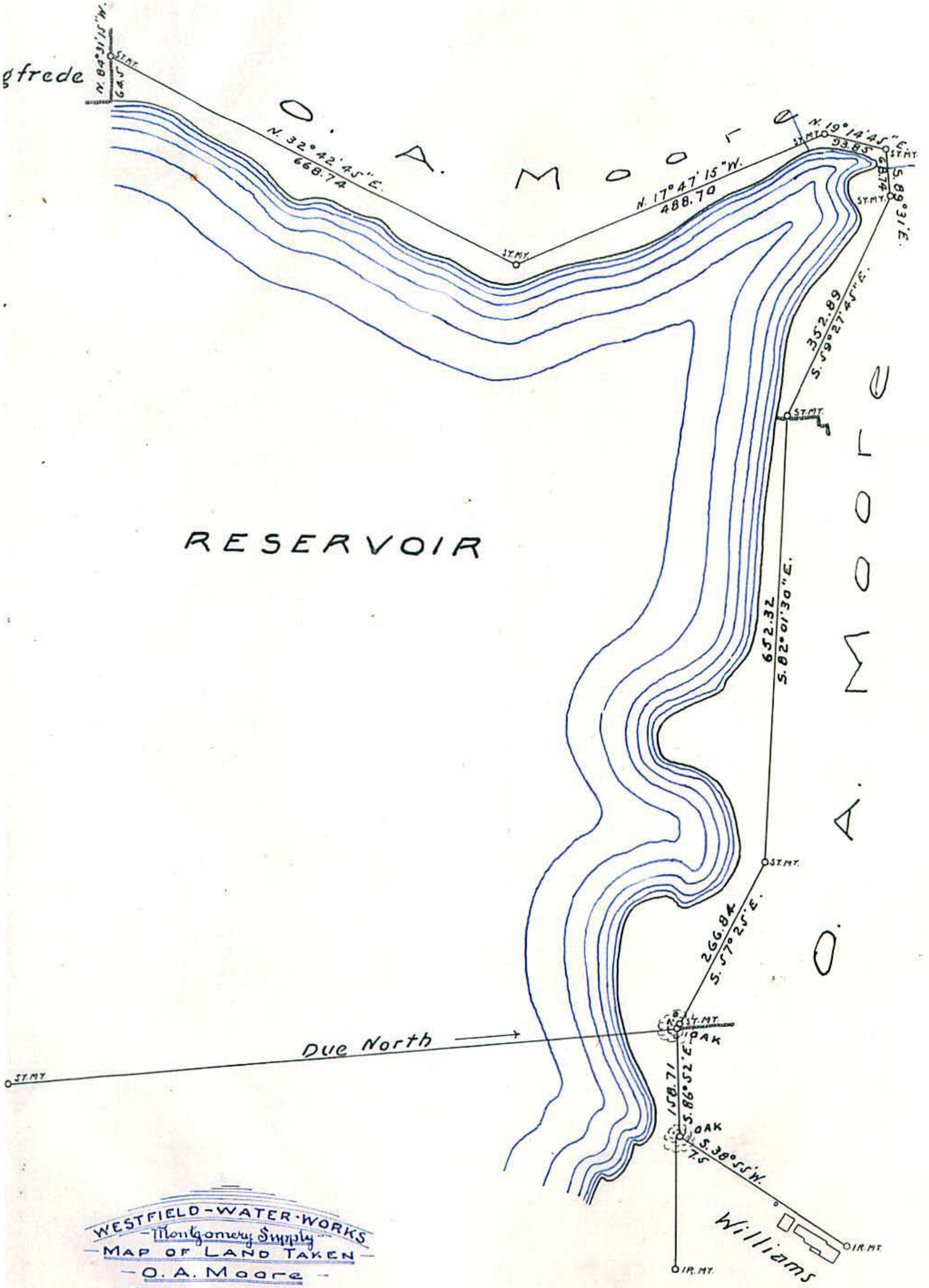
For further description see Map. hereto annexed dated Dec 1883. surveyed by L. F. Root. Variation of Needle 9°45' W.

Dated at Westfield Mass. this 20th day of December A.D. 1883.

Reuben Noble
Lewis R. Norton
Chauncey D. Allen

} Water Commissioners
for the
Town of Westfield.

Received December 26th 1883 and Filed in
Hampden County Mass Registry of Deeds
Attest James E. Ruſsell Register



WESTFIELD-WATER-WORKS
-Montgomery Supply-
-MAP OF LAND TAKEN-
-O. A. Moore-
-SCALE: 200 FT. = 1 INCH.-
-OREN E. PARKS-C.E.-
-1904.-

Land taken of Oliver A. Moore, November 21, 1904.

KNOW ALL MEN,

That the Town of Westfield, in accordance with the authority given by an Act of the Legislature of Massachusetts entitled "An Act to Supply the Town of Westfield with Pure Water," approved May 29th., 1873 and for the purposes named in the 1st. and 3rd. sections of said act, have taken and do hereby take the following described land situated in Montgomery, Hampden County, Massachusetts, and supposed to belong to Oliver A. Moore:-

Commencing at the north-easterly corner of land now or formerly of one Bargfrede and in the westerly line of land of Town of Westfield, thence running North 84° 31' 15" West along the division line between land of said Bargfrede and land of Oliver A. Moore, sixty-four and five tenths (64.5) feet to a stone monument, thence North 32° 42' 45" East six hundred sixty-eight and seventy-four one-hundredths (668.74) feet to a stone monument, thence North 17° 47' 15" West four hundred eighty-eight and seven tenths (488.7) feet to a stone monument, thence North 19° 14' 45" East ninety-three and eighty-five one-hundredths (93.85) feet to a stone monument, thence South 89° 31' East sixty-eight and seventy-four one-hundredths (68.74) feet to a stone monument, thence South 59° 27' 45" East three hundred fifty-two and eighty-nine one-hundredths (352.89) feet to a stone monument, thence South 82° 1' 30" East six hundred fifty-two and thirty-two one-hundredths (652.32) feet to a stone monument. thence South 57° 25' East two hundred sixty-six and eighty-four one-hundredths (266.84) feet to a stone monument, thence same course seven feet (7.0') to the center of an oak tree at the end of a stone wall, thence South 86° 52'East one hundred fifty-eight and seventy-one one-hundredths (158.71) feet to an oak tree in the division line between land of said Oliver A. Moore and land of C. A. Williams, thence south 38° 55' West along said division line about seven and five tenths (7.5) feet to land of Town of Westfield, thence westerly and southerly along land of said Westfield to place of beginning. The fore-going taking includes all land included within the above described lines.

Said Town of Westfield, by its Board of Water Commissioners, Sumner W. Hildreth and Frank S. Dewey, Jr., for the purposes aforesaid has taken all the rights to the above described tract of land.

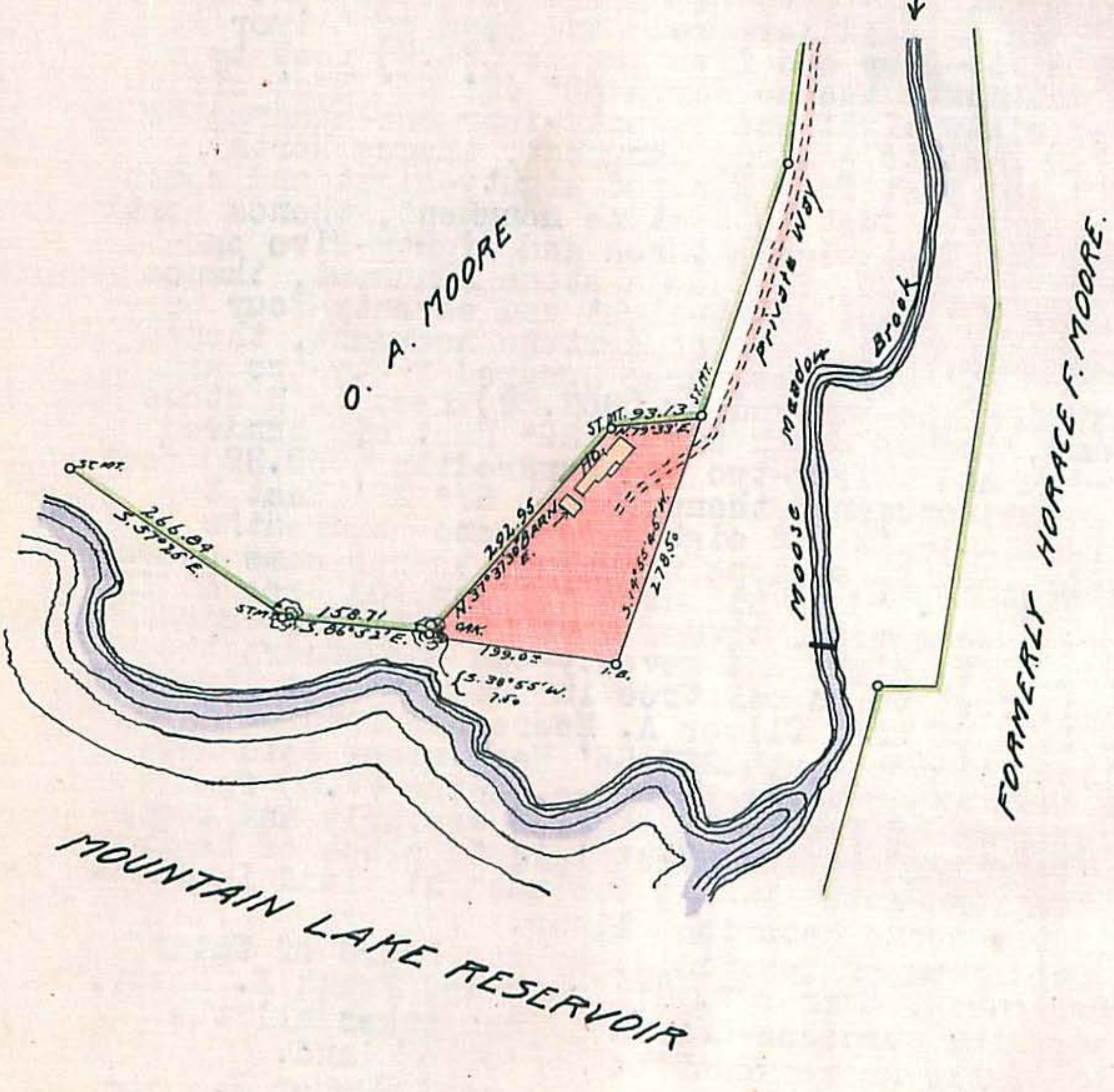
In witness whereof, we, the said Sumner W. Hildreth and Frank S. Dewey, Jr. have hereunto set our hands this twenty-first day of November in the year of our Lord, One Thousand Nine Hundred and Four.

(Signed) Frank S. Dewey Jr

S. W. Hildreth

In the presence of

Clifford A. Tucker



WESTFIELD-WATER-WORKS
Montgomery Supply
-MAP OF LAND TAKEN-
-F. E. WILLIAMS-
-SCALE: 200 FT. = 1 INCH.-
-OREN E. PARKS-C.E.-
-1905-

Land taken formerly of Frances E. Williams, July 1, 19o5.

KNOW ALL MEN,

That the Town of Westfield, in accordance with the authority given by an Act of the Legislature of Massachusetts entitled "An Act to Supply the Town of Westfield with Pure Water," approved May 29th., 1873 and for the purposes named in the 1st. and 3rd. sections of said act, have taken and do hereby take the following described land situated in Montgomery, Hampden County, Massachusetts, and formerly belonging to Frances E. Williams:-

Commencing at an iron monument at the southeasterly corner of land formerly of Frances E. Williams and at the southwesterly corner of land of Town of Westfield taken of O. A. Moore Dec. 2o, 1883, thence westerly along land of Town of Westfield about one hundred ninety-nine (199.o) feet, thence North 38°55' East along land of Town of Westfield about seven and five tenths (7.5) feet to the centre of an oak tree, thence North 37°37' 3o" East along land of O. A. Moore two hundred ninety-two and ninety-five one-hundredths (292.95) feet to a stone monument, thence North 79°33' East along land of said Moore ninety-three and thirteen one-hundredths (93.13) feet to land of said Town, thence South 14°55' 45" West along land of said Town two hundred seventy-eight and five tenths (278.5) feet to the place of beginning.

Said Town of Westfield, by its Board of Water Commissioners, Sumner W. Hildreth, F. S. Dewey Jr. and J. Horton Packard, for the purposes aforesaid have taken all the rights to the above described tract of land.

In witness whereof, we, the said Sumner W. Hildreth, F. S. Dewey Jr. and J. Horton Packard have hereunto set our hands this first day of July in the year of our Lord, one thousand nine hundred and five.

(Signed) S. W. Hildreth. Chairman
F. S. Dewey Jr
J. H. Packard Treasr.

In the presence of
Orin E. Parks

HAMPDEN COUNTY REGISTRY OF DEEDS.
AUG 16 1905
Received 10 H. 15 M. a.m.

Westfield Water Works - Granville Supply - Description of land Taken & Location Maps - 1908

1908 Reports

"Westfield Water Works - Granville Supply - Description of Lands Taken & Location Maps 1908". Filed Hampden County Registry of Deeds November 16, 1908, James R. Wells, Register. Chapter 342 Acts 1895.

City/Town	Granville
City/Town	Westfield
Name	Peck, L O
Name	Sullivan, Jerry
Name	Sullivan, Katie A
Name	Peck, A E
Name	Fowler, Joseph J
Name	Allen, Flavia J
Name	Winchell, Artemese
Name	Jones, Wilbur S
Name	Holcomb, Elizabeth A
Name	Holcomb, William O
Name	Consolatti, Stephen
Name	Carew, Justin G
Name	Kellogg, Eliza E
Name	Tice, Dustin A
Name	Sauers, Rosa M
Name	Bruch, A J

Name	Roach, David L
Name	Phelan, Mary J
Name	Pendelton, Wilbur
Name	Hollister, Sarah E
Name	Clifford, Dennis
Name	Hollister, Hubbard
Name	McDonald, Nellie Shoughrue
Name	Noble, Andelusia
Railroads	New York New Haven & Hartford Railroad Company
Railroads	Holyoke & Westfield Railroad
Streets	Granville Road
Streets	Northampton Road
Streets	Mountain Road
Streets	Old Granville Road
Streets	West Granville Road
Streets	Phelon Road
Streets	Wild Cat Road
Water	Munn's Brook
Water	Tillotson Brook
Water	Japhet Brook
Water	Hollister Brook
Water	Hollister Brook

DESCRIPTION
OF
LANDS TAKEN
AND
LOCATION MAPS
WESTFIELD
WATER WORKS
MONTGOMERY
SUPPLY
1905

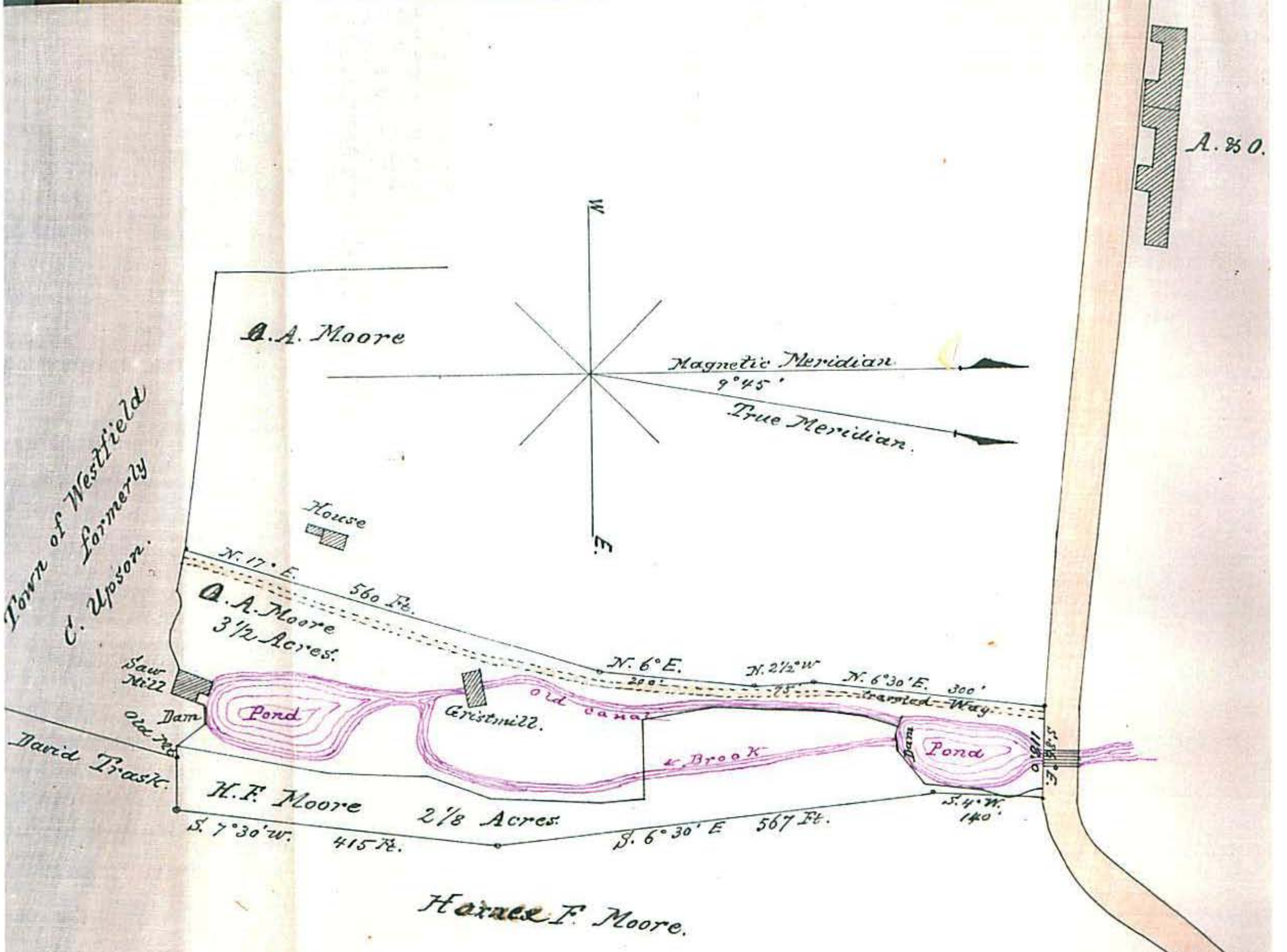
499

HAMPDEN COUNTY REGISTRY OF DEEDS.

JAN 16 1906

Received 10 H. 55 M. a.m.

James R. Wells Reg.



Westfield Water Works

Map

showing Location of Mill Property

of

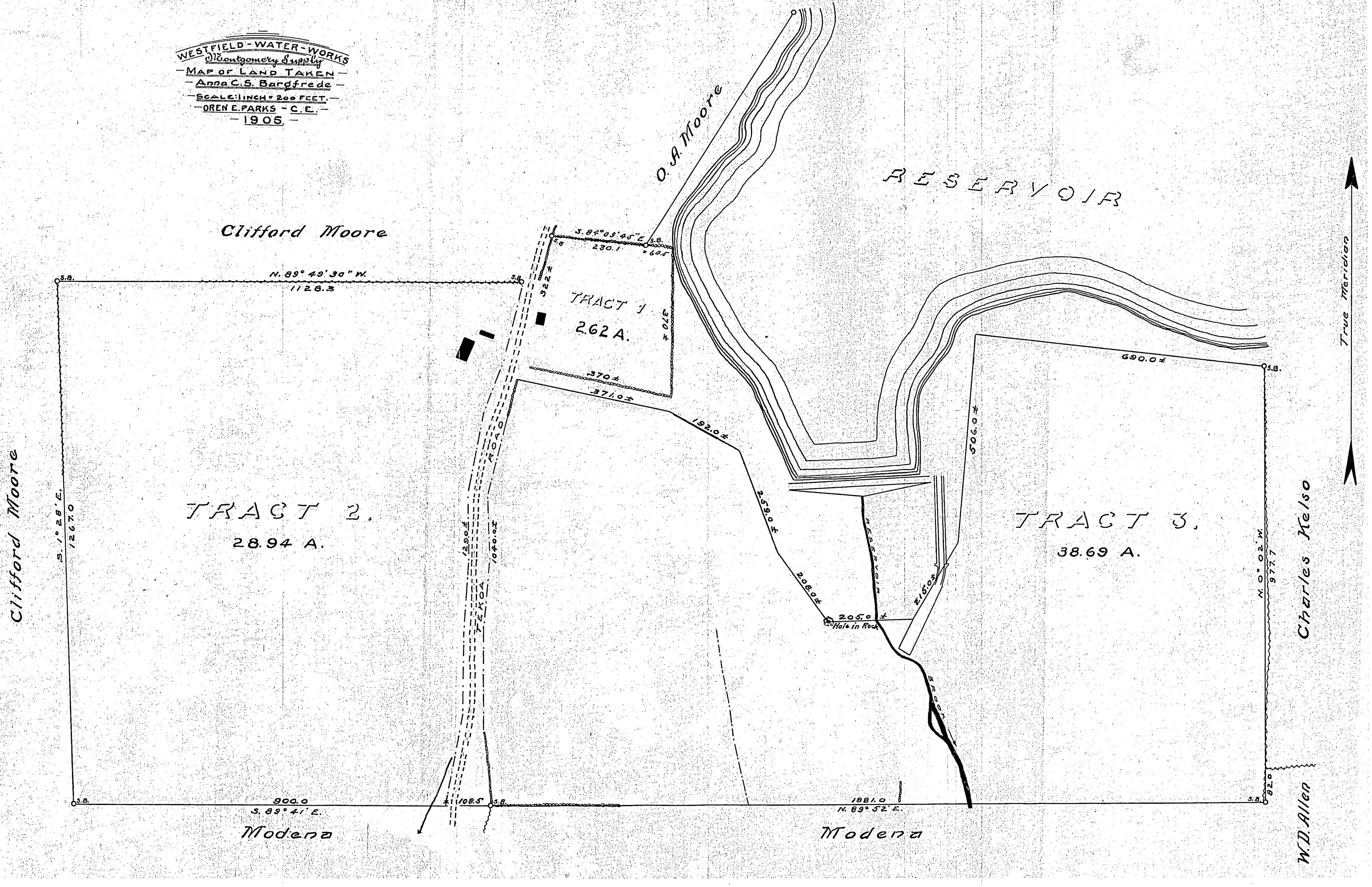
Q. A. Moore.

Montgomery. Mass.

Surveyed by L. F. Root. C.E. Dec. 1883

Scale: 200 Ft. = one inch.

WESTFIELD-WATER-WORKS
Montgomery Supply
—MAP OF LAND TAKEN—
—Anna C.S. Bargfrede—
—SCALE: 1 INCH = 200 FEET.—
—OREN E. PARKS — C.E.—
—1906.—



Land taken of Anna C. S. Bargfrede, November 28th., 1905.

KNOW ALL MEN,

That the Town of Westfield, in accordance with the authority given by an Act of the Legislature of Massachusetts entitled "An Act to Supply the Town of Westfield with Pure Water", approved May 29th., 1873 and for the purposes named in the 1st. and 3rd. sections of said act, have taken and do hereby take the following described land situated in Montgomery, Hampden County, Massachusetts, and supposed to belong to Anna C. S. Bargfrede:-

Tract #1. Commencing at a stone monument on the easterly side of the highway and in the division line between land of O. A. Moore and land of said Bargfrede, thence South 84° 09' 45" East along land of said Moore two hundred thirty and one tenth (230.1) feet to a stone monument at land of Town of Westfield, thence same course along land of Town of Westfield about sixty-four and five tenths (64.5) feet, thence southerly along land of said Westfield about three hundred seventy (370.) feet, thence westerly along land of said Westfield about three hundred seventy (370.) feet to the highway, thence northerly along the highway about three hundred twenty-two (322.) feet to the place of beginning, containing about 2.62 acres.

Tract #2. Commencing at a stone monument on the westerly side of the highway and in the division line between land of Clifford Moore and land of said Bargfrede, said monument bearing South 33° 43' 45" West one hundred thirty-three and four tenths (133.4) feet from the first mentioned monument in the description of tract #1, thence North 89° 49' 30" West along land of said Moore eleven hundred twenty-eight and three tenths (1128.3) feet to a stone monument, thence South 1° 28' East along land of said Clifford Moore twelve hundred sixty-seven (1267.) feet to a stone monument at land of one Modena, thence South 89° 41' East along land of said Modena about nine hundred (900.) feet to a point on the westerly side of the highway, said point bearing North 89° 41' West one hundred eight and five tenths (108.5) feet from a stone monument on the easterly side of the highway at the commencment of the description of tract #3, thence northerly along the highway about twelve hundeed ninety (1290.) feet to place of beginning, containing about 28.94 acres.

Tract #3. Commencing at a stone monument on the easterly side of the highway and in the division line between land supposed to belong to one Modena and land of said Bargfrede, thence North 89° 52' East along land of said Modena eighteen hundred eighty-one (1881.) feet to a stone monument at land supposed to belong to W. D. Allen, thence North 0° 02' West along land of said Allen about eighty-two (82.) feet to land supposed to belong to Chas. Kelso, thence same course along land of said Kelso nine hundred seventy-seven and seven tenths (977.7) feet to a stone monument at land of Town of Westfield, thence westerly along land of said Westfield about six hundred ninety (690) feet, thence southerly along land of said Westfield about five hundred six (506) feet, thence south-westerly along land of said Westfield about two hundred fifteen (215) feet, thence westerly about two hundred five (205) feet, to a hole drilled in a large rock, thence north-westerly along land of said Westfield about two hundeed eight (208) feet, thence north-westerly along land of said Westfield about two hundred fifty-nine (259) feet, thence north-westerly along land of said Westfield about one hundred ninety-two (192) feet, thence westerly along land of said Westfield about three hundred seventy-one (371) feet to the highway, thence southerly along the highway about ten hundred forty (1040) feet to the place of beginning, containing about 38.69 acres.

Said Town of Westfield , by its Board of Water Commissioners, Sumner W. Hildreth, F. S. Dewey Jr. and J. Horton Packard, for the purposes aforesaid have taken all the rights to the above described tracts of land.

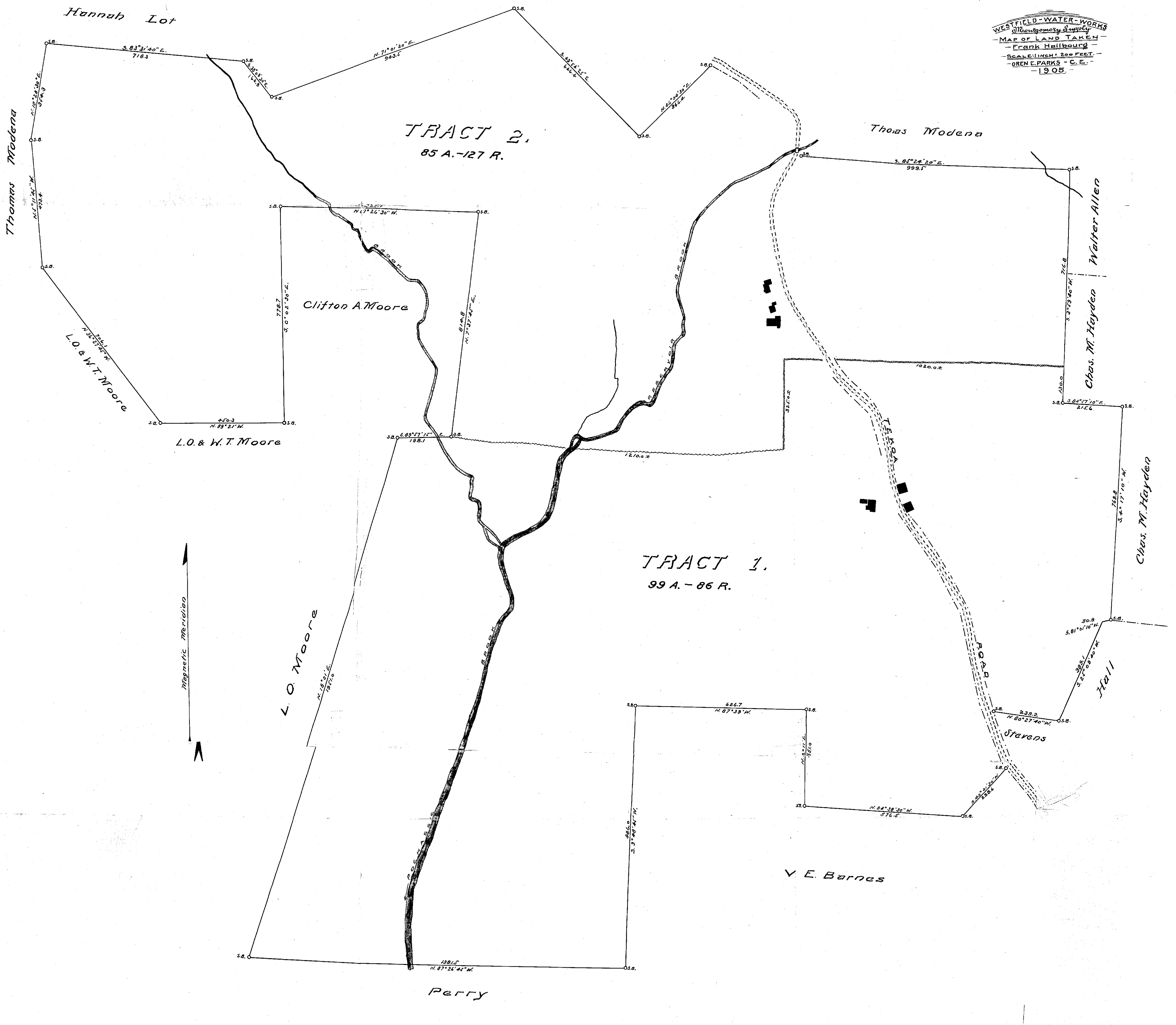
In witness whereof, we , the said Sumner W. Hildreth, F. S. Dewey Jr. and J. Horton Packard, have hereunto set our hands this twenty-eighth day of November in the year of our Lord, one thousand nine hundred and five.

(Signed) Sumner W. Hildreth) Board of Water
James Horton Packard)-
Frank S Dewey Jr) Commissioners.

In the presence of

Orin E. Parks

WESTFIELD-WATER-WORKS
Montgomery Supply
-MAP OF LAND TAKEN-
-Frank Hallbourg-
-SCALE: 1 INCH = 200 FEET.-
-OREN E. PARKS - C.E.-
-1905-



Land taken of Frank Hallbourg, December 1, 19o5.

KNOW ALL MEN,

That the Town of Westfield, in accordance with the authority given by an Act of the Legislature of Massachusetts entitled "An Act to Supply the Town of Westfield with Pure Water", approved May 29th., 1873 and for the purposes named in the 1st. and 3rd. sections of said act, have taken and do hereby take the following described land situated in Montgomery, Hampden County, Massachusetts, and supposed to belong to Frank Hallbourg.

Tract #1. Commencing at a stone monument on the westerly side of the Tekoa Road, so called, in the division line between land of said Hallbourg and land supposed to belong to V. E. Barnes, thence South 42° 41' 3o" West about two hundred thirty-eight and six tenths (238.6) feet to a stone monument, thence North 84° 38' 3o" West about five hundred seventy-six and five tenths (576.5) feet to a stone monument, thence North 2° 11' East about three hundred fifty-one (351.o) feet to stone monument, thence North 87° 39' West about six hundred twenty-six and seven tenths (626.7) feet to a stone monument, thence South 3° 48' 45" West about nine hundred forty-six (946.o) feet to a stone monument at land supposed to belong to one Perry; the five preceeding courses are along land supposed to belong to said V. E. Barnes, thence North 87° 26' 45"West along land of said Perry about thirteen hundred eighty-one and five tenths (1381.5) feet to a stone monument at land supposed to belong to L. O. Moore, thence North 18° o1' East along land of said Moore about nineteen hundred fifty-one (1951.o) feet to a stone monument at land supposed to belong to Clifton A. Moore, thence South 89° 57' 15" East along land of said Moore about one hundred ninety-eight and one tenth (198.1) feet to a stone monument at land of Frank Hallbourg, formerly of Fitzhugh Hoag, thence easterly along land formerly of said Hoag about twelve hundred ten (121o.o) feet, thence northerly along land formerly of said Hoag about three hundred twenty-five (325.o) feet, thence easterly crossing the Tekoa Road about ten hundred twenty (1o2o.o) feet to land supposed to belong to Chas. M. Hayden, thence South 3° 59' 4o" West about one hundred thirty (13o.o) feet to a stone monument, thence South 84° 57' 1o" East about two hundred fifteen and six tenths (215.6) feet to a stone monument, thence South 4° 17' 1o" West about seven hundred sixty-nine and eight tenths (769.8) feet to a stone monument at land supposed to belong to one Hall: the last three courses are along land of Chas. M. Hayden, thence South 81° o1' 1o" West along land of said Hall about thirty and nine tenths (3o.9) feet, thence South 25° o9' 4o" West along land of said Hall about three hundred eighty-nine and one tenth (389.1) feet to a stone monument, thence North 8o° 27' 4o " West along land of Hall and land supposed to belong to one Stevens about two hundred thirty-nine and two tenths (239.2) feet to a stone monument on the easterly side of the Tekoa Road: said monument bearing North 11° o7' 3o" West about two hundred fourteen and one tenth (214.1) feet from the first mentioned monument, thence southerly along the highway to the place of beginning. Containing about ninety-nine acres and eighty-six square rods (99 A. 86 R.) The foregoing described tract being what is known as the McGill Farm and deeded to said Hallbourg by Michael and Sarah R. McGill June 2oth., 19o5 and recorded in Hampden County Registry of Deeds, Book 694, Page 2o9.

Tract #2. Commencing at a stone monument at the south-easterly corner of land supposed to belong to Clifton A. Moore and in the northerly line of tract #1, thence North 7° 37' 45" East about eight hundred fourteen and eight tenths (814.8) feet to a stone monument, thence North 87° 26' 3o" West about seven hundred twenty-six and one tenth(726.1) feet to a stone monument, thence South oo° o2' 3o" East about seven hundred seventy-eight and seven tenths (778.7) feet to a stone monument at land supposed to belong to

L. O. & W. T. Moore; the three last courses are along land of C. A. Moore, thence North 89° 21' West along land of L.O. & W.T. Moore about four hundred fifty and three tenths (45o.3) feet to a stone monument, thence North 36° 27' 45" West along land of L.O. & W.T. Moore and the "Unknown Lot", so called, about seven hundred six and one tenth (7o6.1) feet to a stone monument, thence North 5° 11' 45" West along land supposed to belong to Thomas Modena about four hundred seventy-three and four tenths (473.4) feet to a stone monument on top of a large boulder, thence North 1o° 28' 3o" East along land of said Modena about three hundred fifty-four and three tenths (354.3) feet to a stone monument, thence South 83° 31' 4o" East about seven hundred eighteen and three tenths (718.3) feet to a stone monument, thence South 38° o8' 3o" East about one hundred sixty-four and eight tenths (164.8) feet to a stone monument, thence North 71° o1' 2o" East about nine hundred forty-three and five tenths (943.5) feet to a stone monument, thence South 43° 54' 25" East about six hundred forty-six and four tenths (646.4) feet to a stone monument, thence North 46° o4' 3o" East about three hundred sixty-six and four tenths (366.4) feet to a stone monument on the westerly side of the Tekoa Road, thence south-easterly along the said Tekoa Road to a stone monument on the easterly side of said road, bearing South 44° 36' 45" East about four hundred sixty-three and three tenths (463.3) feet from last mentioned monument, thence South 85° 24' 2o" East along land of Thomas Modena about nine hundred ninety-nine and five tenths (999.5) feet to a stone monument at land supposed to belong to Walter Allen, thence South 3° 59' 4o" West along land of said Allen and land of Chas. M. Hayden about seven hundred sixteen and eight tenths (716.8) feet to a point at north-easterly corner of tract #1, thence westerly crossing the Tekoa Road about ten hundred twenty (1o2o.) feet, thence southerly about three hundred twenty-five (325.) feet, thence westerly about twelve hundred ten (121o.) feet to place of beginning. Containing about eighty-five acres one hundred twenty-seven square rods (85 A. 127 R.) The foregoing described tract being the same tract deeded to said Hallbourg by Florian Anton, October 16th., 19o5 and recorded in Hampden County Registry of Deeds, Book 691, Page 149.

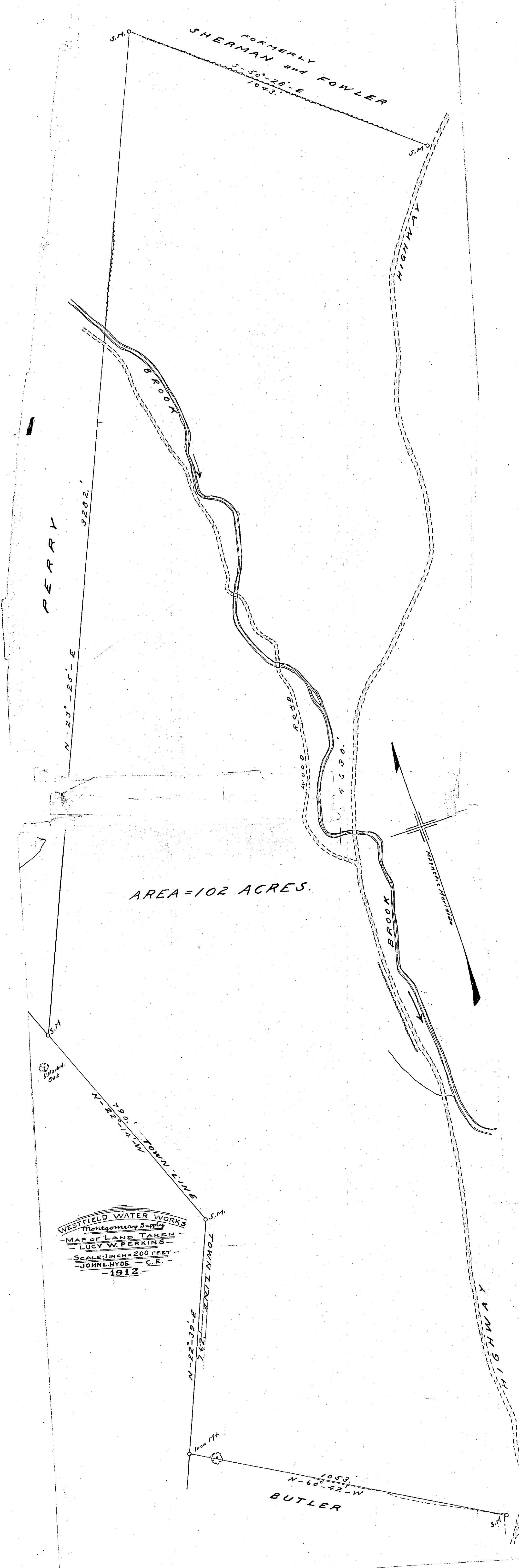
Said Town of Westfield, by its Board of Water Commissioners, Sumner W. Hildreth, F. S. Dewey Jr. and J. Horton Packard, for the purposes aforesaid have taken all the right to the aforedescribed tracts of land.

In witness whereof, we, the said Sumner W. Hildreth, F. S. Dewey Jr. and J. Horton Packard, have hereunto set our hands this first day of December in the year of our Lord, one thousand nine hundred and five.

(Signed) Sumner W. Hildreth ....)
James Horton Packard ....)- Board of Water
Frank S Dewey Jr ....) Commissioners.

In the presence of

Oren E. Parks ....



WESTFIELD WATER WORKS
Montgomery Supply
MAP OF LAND TAKEN
LUCY W. PERKINS
SCALE: 1 INCH = 200 FEET
JOHN L. HYDE — C.E.
1912

Land taken of Lucy W. Perkins, May 1, 1912.

KNOW ALL MEN,

That the Town of Westfield, in accordance with the authority given by an Act of the Legislature of Massachusetts entitled "An Act to Supply the Town of Westfield with Pure Water", approved May 29, 1873 and for the purpose named in the 1st. and 3rd. sections of said Act, have taken and do hereby take the following described land situated in Montgomery, Hampden County, Massachusetts, and supposed to belong to Lucy W. Perkins.

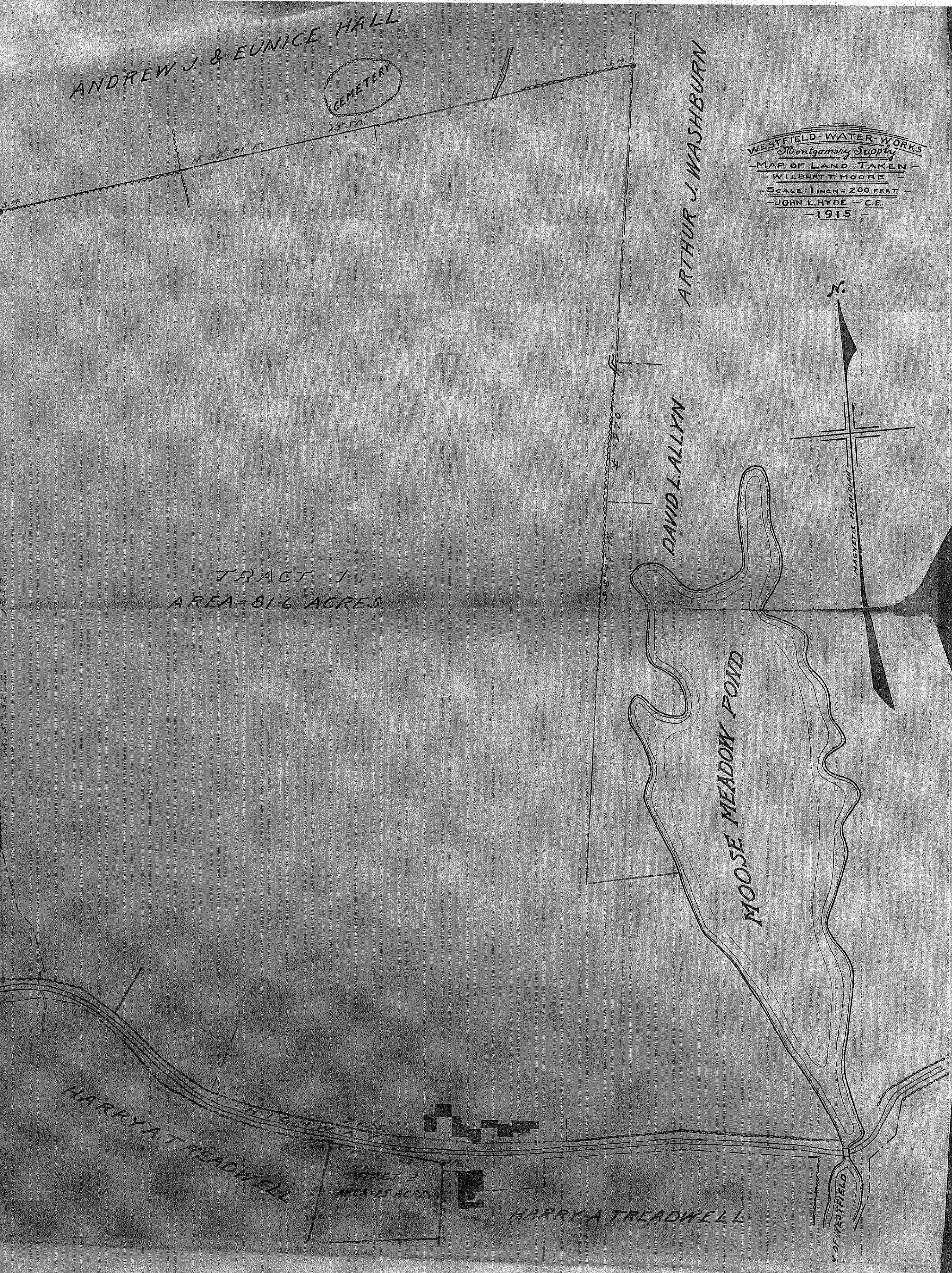
Commencing at a stone monument on the westerly side of the highway at land of F. M. Butler; thence N. 60°42' W. along land of said Butler about one thousand fifty-three (1053) feet to an iron monument supposed to be in the Montgomery and Russell town line; thence N 22°39' E. about seven hundred sixty-two (762) feet to a stone monument supposed to be in the said town line; thence N.22°14' W. about seven hundred ninety (790) feet to a stone monument supposed to be in the said town line and at land of Perry; thence N. 23°25' E. along land of said Perry, about three thousand two hundred eighty-two (3282) feet to a stone monument at land formerly of Sherman and Fowler; thence S. 50°28' E. along said land about one thousand forty-three (1043) feet to a stone monument on the westerly side of the highway; thence southerly along said highway about four thousand six hundred thirty (4630) feet to the place of beginning, containing about one hundred two (102) Acres. The foregoing described tract being the same tract deeded to said Lucy W. Perkins by Leon D. Blood etc. May 15, 1911 and recorded in Hampden County Registry of Deeds, Book 823, Page 334 and by Luther Hollister etc. April 10, 1911 and recorded in Hampden County Registry of Deeds, Book 805, Page 461.

Said Town of Westfield, by its Board of Water Commissioners S. A. Allen, S. W. Hildreth and J. S. Davine, for the purpose aforesaid have taken all right to the afore described tract of land.

In Witness Whereof, we, the said S. A. Allen, S. W. Hildreth and J. S. Davine, have hereunto set our hands this first day of May in the year of our Lord, one thousand nine hundred and twelve.

(Signed) S. A. Allen
Jas. S. Davine
Board of Water Commissioners.

In the presence of Geo. P. Kife


WESTFIELD - WATER - WORKS
Montgomery Supply
- MAP OF LAND TAKEN -
- WILBERT T. MOORE -
- SCALE: 1 INCH = 200 FEET -
- JOHN L. HYDE - C.E. -
- 1915 -
ANDREW J. & EUNICE HALL
CEMETERY
S.M.
1550'
N. 82° 01' E.
S.M.
ARTHUR J. WASHBURN
N.
MAGNETIC MERIDIAN
S. 8° 45' W.
± 1970'
DAVID L. ALLYN
TRACT 1.
AREA = 81.6 ACRES.
N. 5° 52' E. 1832.
MOOSE MEADOW POND
HIGHWAY
2125'
S.M.
280'
S.M.
TRACT 2.
AREA = 1.5 ACRES
324'
HARRY A. TREADWELL
HARRY A TREADWELL
Y OF WESTFIELD

(Wilbert T. Moore)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefor, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this twenty-ninth day of December, in the year nineteen hundred and fifteen, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said land and property are situated in Montgomery in said County of Hampden, and are described as follows:-

Tract #1. Commencing at a point in the northerly line of the highway passing the Mountain House and in the middle of Moose Meadow Brook, thence westerly along said highway about twenty-one hundred and twenty-five feet to a stone monument at land of Andrew J. & Eunice Hall, thence North 5° 52' East about eighteen hundred thirty-two (1832) feet to a stone monument, thence North 82° 01' East about fifteen hundred fifty (1550) feet to a stone monument at land of Arthur J. Washburn, the last two courses are along land of said Hall, thence South 8° 45' West along lands of said Washburn and of David L. Allyn about nineteen hundred seventy (1970) feet, thence easterly along said Allyn to Moose Meadow Pond, thence southerly along said Pond to the place of beginning, containing about eighty-one and six tenths (81.6) acres.

Tract #2. Commencing at a stone monument on the southerly side of the highway passing the Mountain House about opposite the middle of Tract #1, thence South 9° 14' West about one hundred eighty-two (182) feet, thence North 87° West about three hundred twenty-four (324) feet, thence North 19° East about two hundred fifty (250) feet to a stone monument on the southerly side of said highway, the three preceding courses are along land of Harry A. Treadwell and defined by stone walls, thence South 74° 21' East about two hundred eighty (280) feet to the place of beginning, containing about one and five tenths (1.5) acres.

The foregoing described tracts are supposed to belong to Wilbert T. Moore of Huntington, Massachusetts.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of

Water Commissioners.

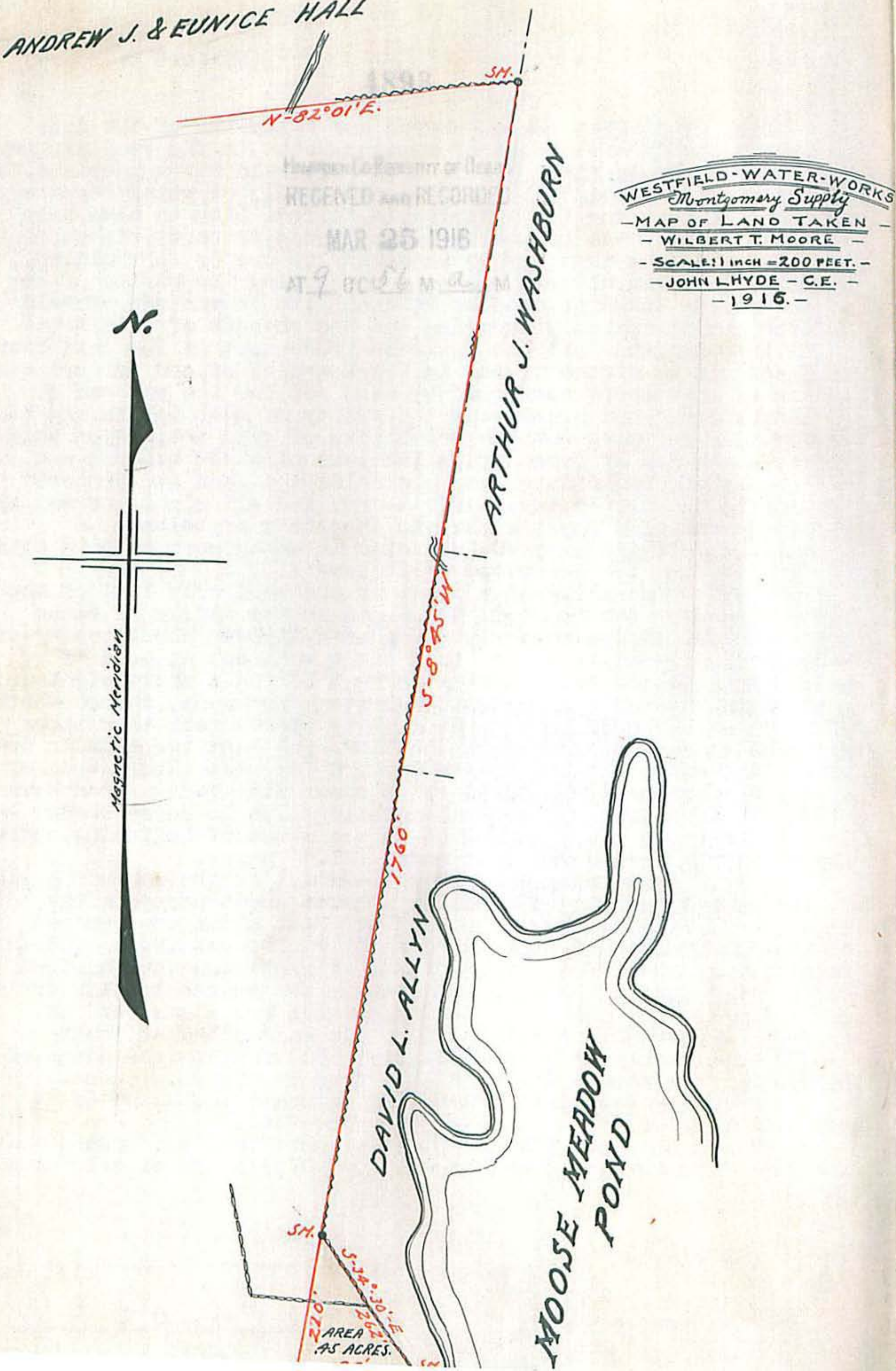
L. W. Hildreth,

Geo. H. Byers

In the presence of Clayton M. Root

4893

HAMPDEN CO REGISTRY OF DEEDS
RECEIVED AND RECORDED
MAR 25 1916
AT 9 O'C 56 M a M



WESTFIELD-WATER-WORKS
Montgomery Supply
-MAP OF LAND TAKEN-
-WILBERT T. MOORE-
-SCALE: 1 INCH = 200 FEET.-
-JOHN L. HYDE - C.E.-
-1916.-

HAMPDEN CO REGISTRY OF DEEDS
RECEIVED AND RECORDED
MAR 25 1916
AT 9 OC 26 M A M

(Wilbert T. Moore)

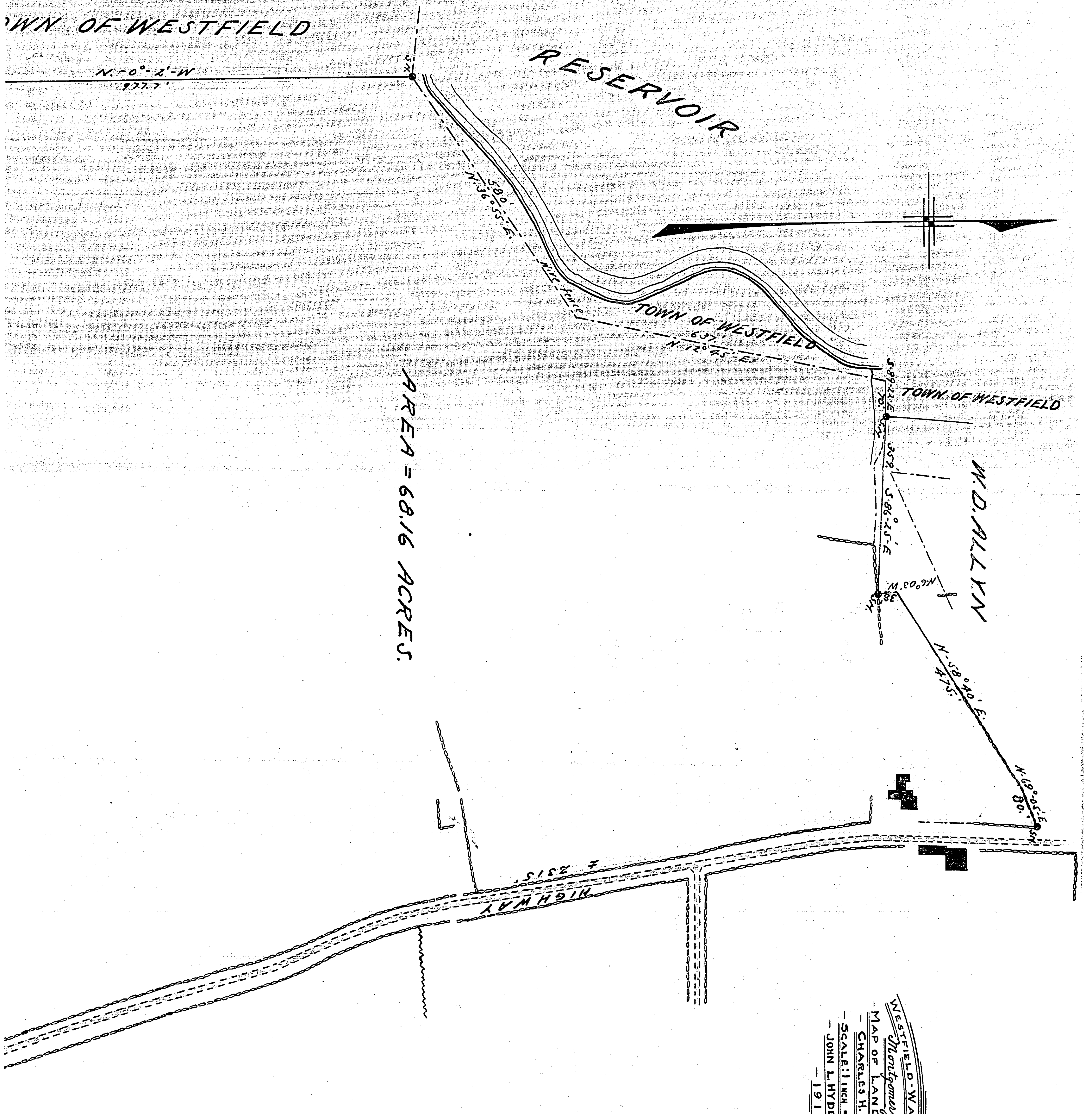
Description of property of the Town of Westfield
located in the Town of Montgomery, Mass.

Commencing at a stone monument in the westerly line of land of David L. Allyn and bearing South 8°45' West about seventeen hundred sixty (1760) feet from a stone monument at the southeasterly corner of land of Andrew J. & Eunice Hall, thence South 34° 30' East along land of said Allyn About two hundred sixty-two (262) feet to a stone monument at land of Town of Westfield, thence westerly about one hundred eighty-five (185) feet, thence North 8°45' East about two hundred ten (210) feet to the place of beginning, containing about forty-five one-hundredths (.45) acres.

December 30, 1915.

2754

HAMPDEN CO REGISTRY OF DEEDS
RECEIVED AND RECORDED
FEB 14 1917
AT 2 O'C. 10 M P M



WESTFIELD WATER WORKS
Montgomery Supply.
MAP OF LAND TAKEN
CHARLES H. KELSO
SCALE: 1 INCH = 200 FEET
JOHN L. HYDE, C.E.
1916

(Charles H. Kelso)

Description of property of the Town of Westfield

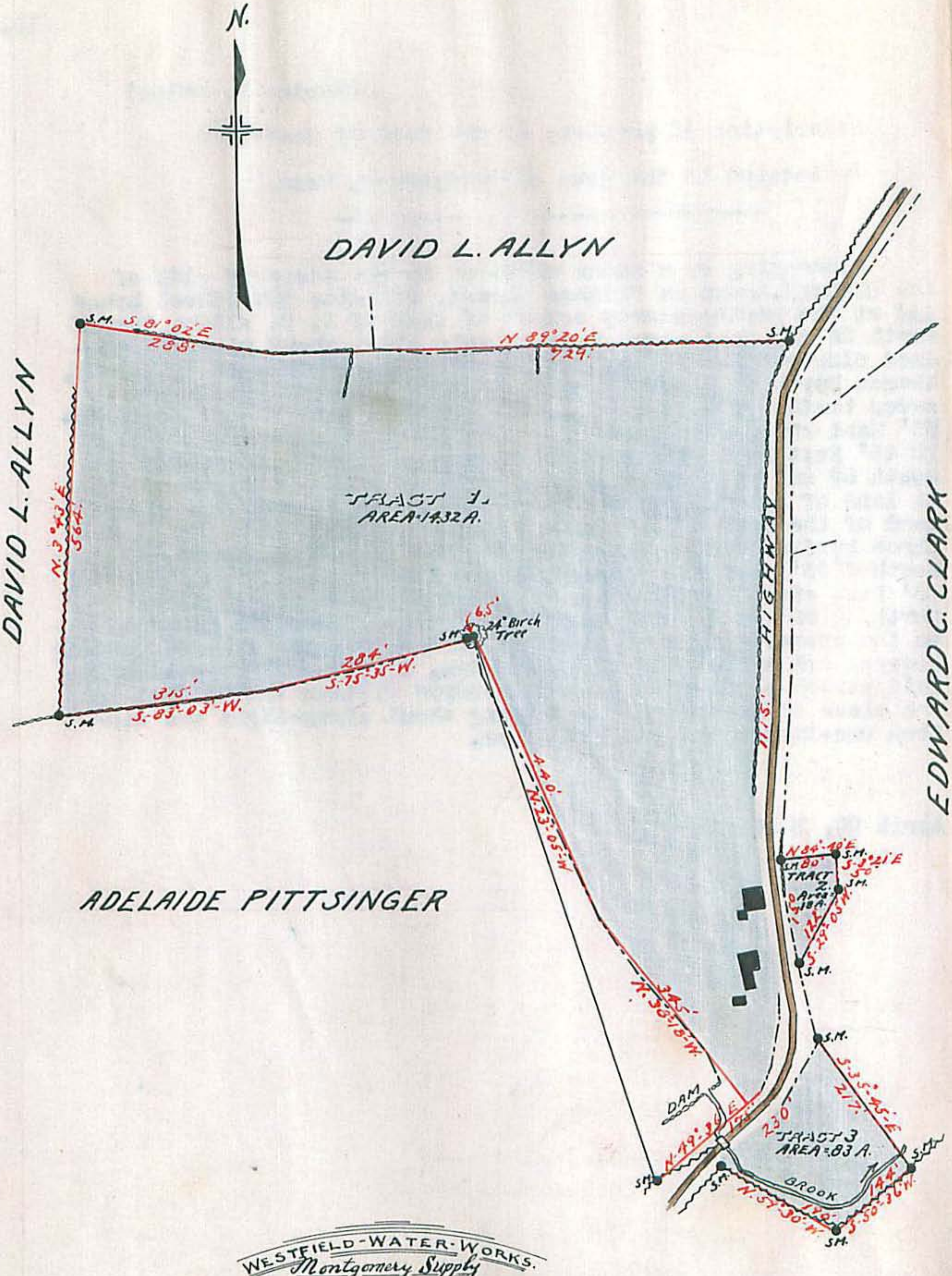
located in the Town of Montgomery, Mass.

Commencing at a stone monument on the westerly side of the highway, known as Pitcher street, opposite the school house and at the northeasterly corner of land of W. D. Allyn, thence North 88°28' West along land of said Allyn about nineteen hundred ninety-three (1993) feet to land of the Town of Westfield, thence North 0°02' West about nine hundred seventy-seven and seven tenths (977.7) feet to a stone monument, thence North 36°55' East about five hundred eighty (580) feet, thence North 12°45' East about six hundred thirty-seven (637) feet, thence South 89°22' East about seventy (70) feet to a stone monument at land of said Allyn, the four preceeding courses are along land of the Town of Westfield, thence South 86°25' East about three hundred fifty-nine (359) feet to a stone monument, thence North 6°03' West about thirty-eight (38) feet, thence North 58° 40' East about four hundred seventy-five (475) feet, thence North 69°05' East about eighty (80) feet to a stone monument on the westerly side of said Pitcher street, the four preceeding courses are along land of said Allyn, thence southerly along said street about twenty-three hundred fifteen (2315) feet to the place of beginning, containing about sixty-eight and sixteen one-hundredths (68.16) acres.

April 29, 1916.

2755

HAMPDEN CO REGISTRY OF DEEDS
RECEIVED AND RECORDED
FEB 14 1917
AT 2 OC 10 M P M



WESTFIELD-WATER-WORKS.
Montgomery Supply
-MAP OF LAND TAKEN-
- OCENIUS E. MOORE -
-SCALE: 1 INCH = 200 FEET-
-JOHN L. HYDE - C.E.-
- 1917 -

(Ocenius E. Moore)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five,the Town of Westfield was authorized,for the purpose of providing an additional supply of water for the use of said Town and its inhabitants,to,from time to time,take and hold,by purchase or otherwise,any lands,property,rights of way and easements that may be necessary or proper for holding, storing,conveying,distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act,and for effectually carrying out the objects of said Act:-

Now,therefor,Know All Men By These Presents,that the said Town of Westfield,by virtue of,and in the exercise of,and in part execution of the powers conferred by said Act,for the purpose of holding,storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act,has,on this sixth day of February,in the year nineteen hundred and seventeen, taken , appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which,in anywise,thereto appertain or belong.

Said land and property are situated in Montgomery in said County of Hampden, and are described as follows:-

Tract #1. Commencing at a stone monument on the westerly side of the highway leading from the Montgomery town hall southerly toward Russell, thence southerly along said highway about eleven hundred and fifteen (1115) feet to land of Adelaide Pittsinger, thence North 38° 18' West about three hundred forty-five (345) feet, thence North 23° 05' West about four hundred forty (440) feet to a 24" black birch tree,thence South 75° 35' West six and five tenths (6.5) feet to a stone monument, thence same course about two hundred eighty-four (284) feet, thence South 83° 03' West about three hundred fifteen (315) feet to a stone monument at land of David L. Allyn, the last four courses are along land of said Pittsinger, thence North 3° 43' East about five hundred sixty-four (564) feet to a stone monument, thence South 81° 02' East about two hundred eighty-eight (288) feet, thence North 89° 20' East about seven hundred twenty-nine (729) feet to the place of beginning, the last three courses are along land of said Allyn, containing about fourteen and thirty-two one-hundredths (14.32) acres.

Tract #2. Commencing at a stone monument on the easterly side of said highway opposite Tract #1 and at the southwest corner of land of Edward C. Clark, thence North 84° 40' East about eighty (80) feet to a stone monument, thence South 3° 21' East about fifty (50) feet to a stone monument, thence South 29° 05' West about one hundred twenty-two (122) feet to a stone monument on the easterly side of said highway, the last three courses are along land of said Clark, thence northerly along said highway about one hundred fifty (150) feet to the place of beginning, containing about eighteen one-hundredths (.18) acres.

Tract #3. Commencing at a stone monument on the easterly side of said highway and in the westerly line of land of said Clark, thence South 35° 45' East about two hundred seventeen (217) feet to a stone monument, thence South 50° 36' West about one hundred forty-four (144) feet to a stone monument, thence North 59° 30' West about one hundred ninety (190) feet to a stone monument on the southerly side of said highway, the last three courses are along land of said Clark, thence northeasterly along said highway about two hundred thirty (230) feet to the place of beginning, containing about eighty-three one-hundredths (.83) acres.

The foregoing described tracts are supposed to belong to Ocenius E. Moore of Huntington, Massachusetts.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of Water Commissioners.

H. C. Lane

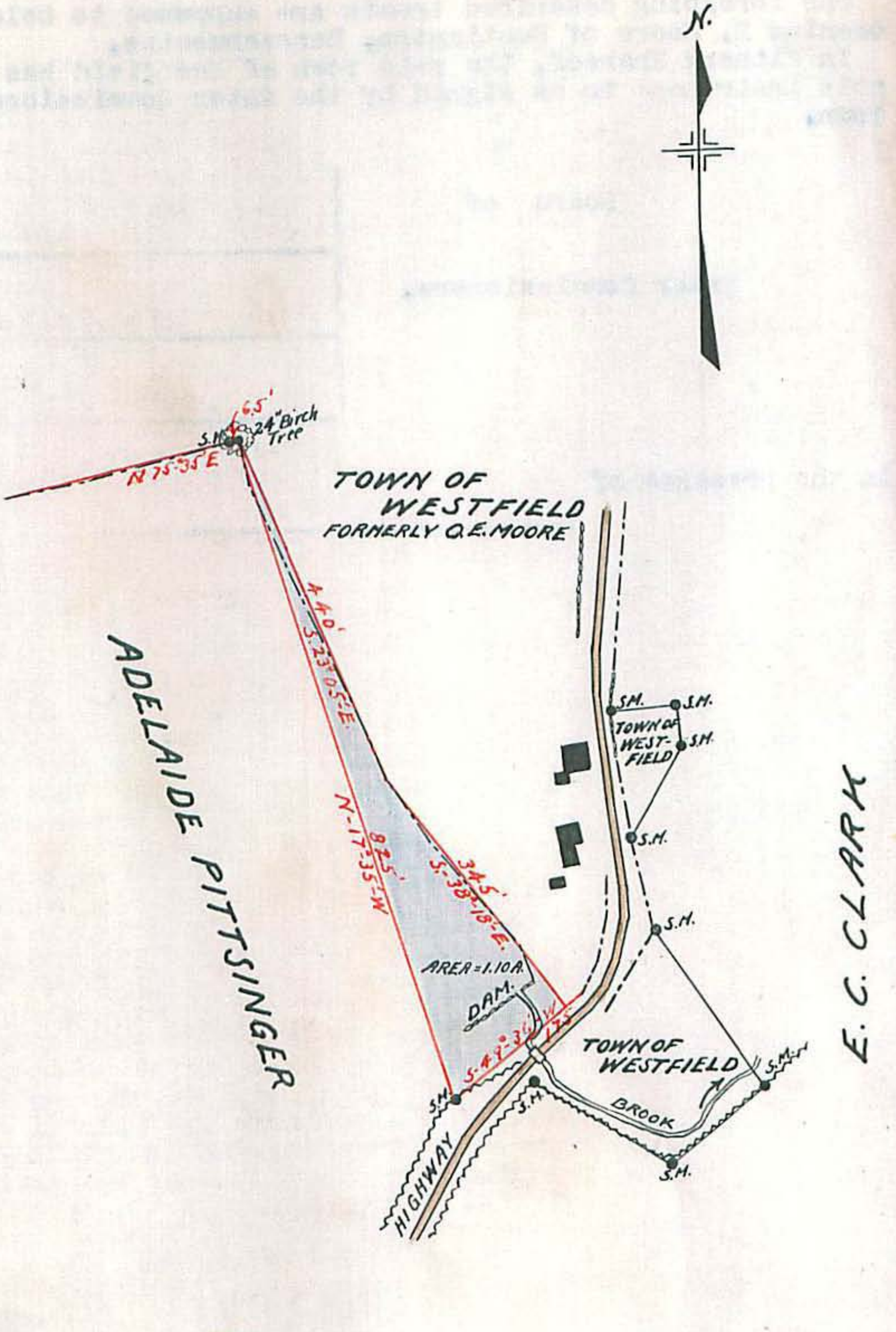
S. W. Hildreth

Geo. H. Byers

In the presence of

2756

HAMPDEN CO. REGISTRY OF DEEDS
RECEIVED AND RECORDED
FEB 14 1917
AT 2 O'C 10 M P M



WESTFIELD-WATER-WORKS.
Montgomery Supply
-MAP OF LAND TAKEN -
- ADELAIDE PITTSINGER-
-SCALE: 1 INCH = 200 FEET -
-JOHN L. HYDE - C.E. -
- 1917 -

(Adelaide Pittsinger)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefor, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part, execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this sixth day of February, in the year nineteen hundred and seventeen, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said land and property are situated in Montgomery in said County of Hampden, and are described as follows:-

Commencing at a point on the northerly side of the highway leading from the Montgomery town hall toward Russell and at the southwesterly corner of land of the Town of Westfield, formerly of O. E. Moore, thence South 49° 36' West along said highway about one hundred seventy-five (175) feet to a stone monument, thence North 17° 35' West along land of said Pittsinger about eight hundred twenty-five (825) feet to a 24" black birch tree at land of said Town, thence South 23° 05' East about four hundred forty (440) feet, thence South 38° 18' East about three hundred forty-five (345) feet to the place of beginning, the last two courses are along land of said Town, formerly of said Moore, containing about one and one tenth (1.1) acres.

The foregoing described tract is supposed to belong to Adelaide Pittsinger of Montgomery, Massachusetts.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of
Water Commissioners.

H. C. Lane
S. W. Hildreth.
Geo. H. Byers

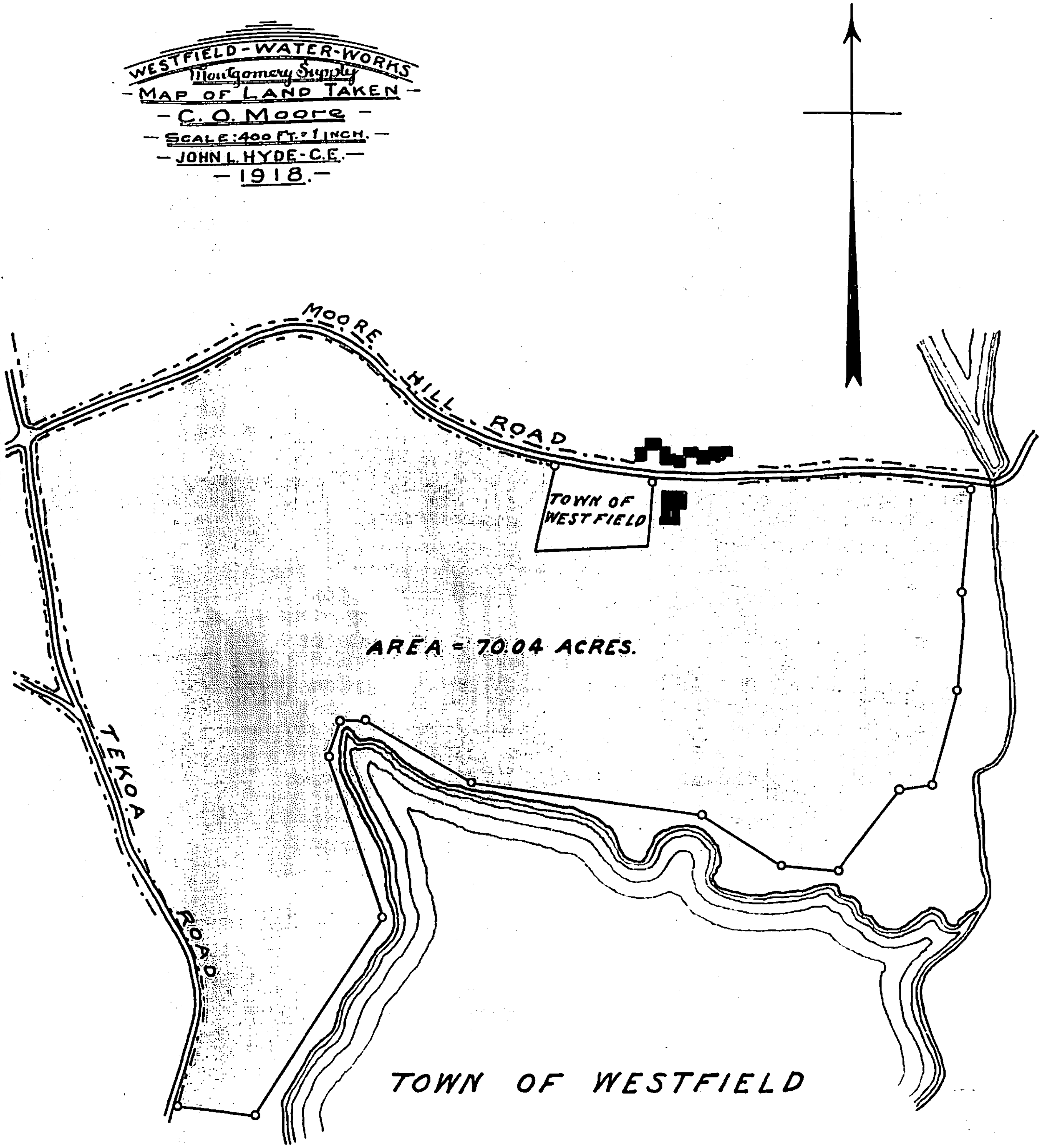
In the presence of

____

2757

HAMPDEN CO. REGISTRY OF DEEDS
RECEIVED AND RECORDED
FEB 14 1917
AT 2 OC 10 M P M

WESTFIELD - WATER - WORKS
Montgomery Supply
- MAP OF LAND TAKEN -
- C. O. Moore -
- SCALE: 400 FT. = 1 INCH. -
- JOHN L. HYDE - C.E. -
- 1918. -



HAMPDEN CO. REGISTRY OF DEEDS
RECEIVED AND RECORDED
JUL 3 1918
AT 3 OC 15 M P M

(Clifford O. Moore)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefor, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this seventh day of May, in the year nineteen hundred and eighteen, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which , in anywise, thereto appertain or belong.

Said land and property are situated in Montgomery in said County of Hampden, and are described as follows:-

Bounded north by the Moore Hill road and land of the Town of Westfield, east and south by land of the Town of Westfield, and west by the Tekoa road, containing about seventy and four one-hundredths (70.04) acres.

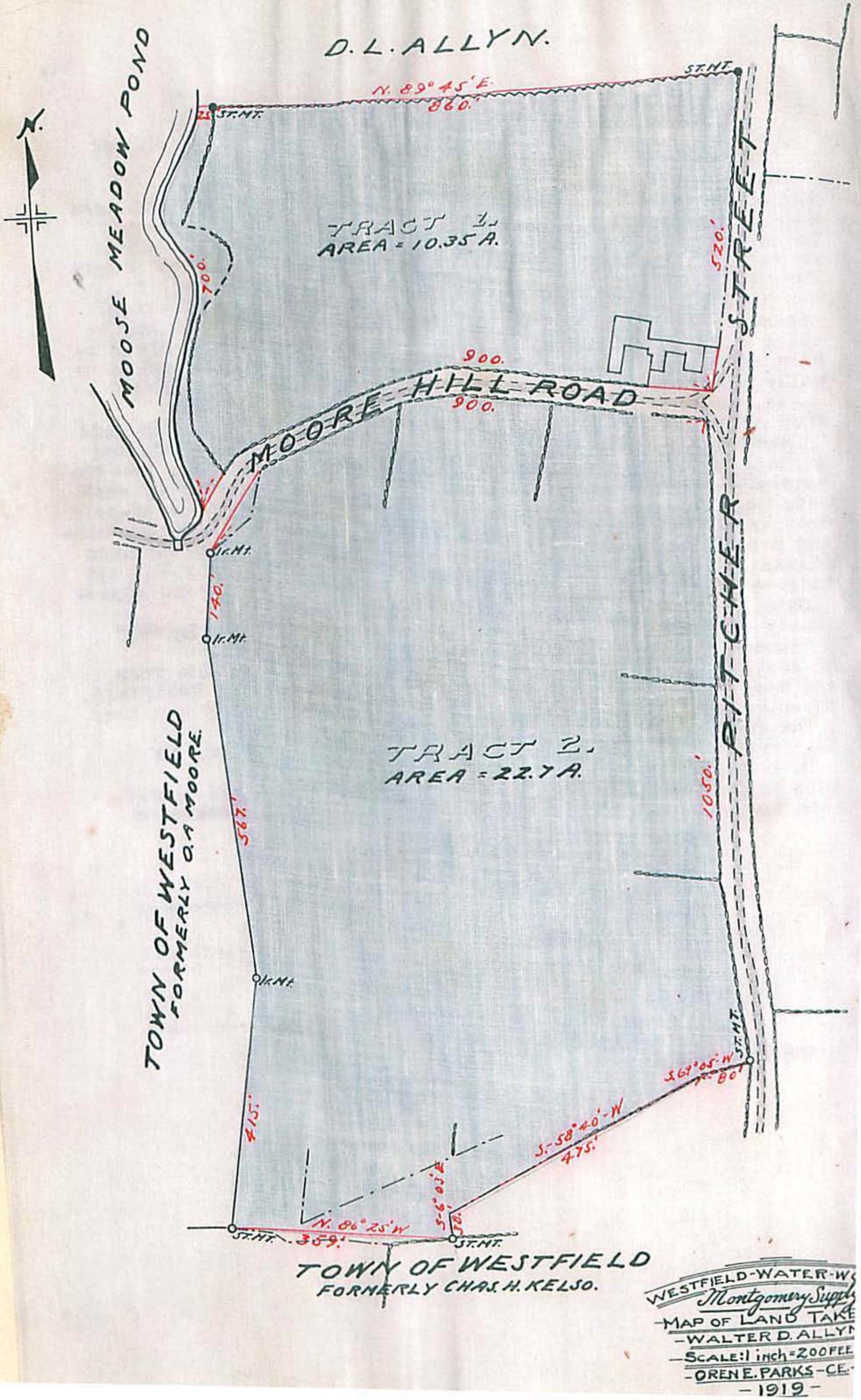
The foregoing described tract is supposed to belong to Clifford O. Moore of Hartford, Conn.

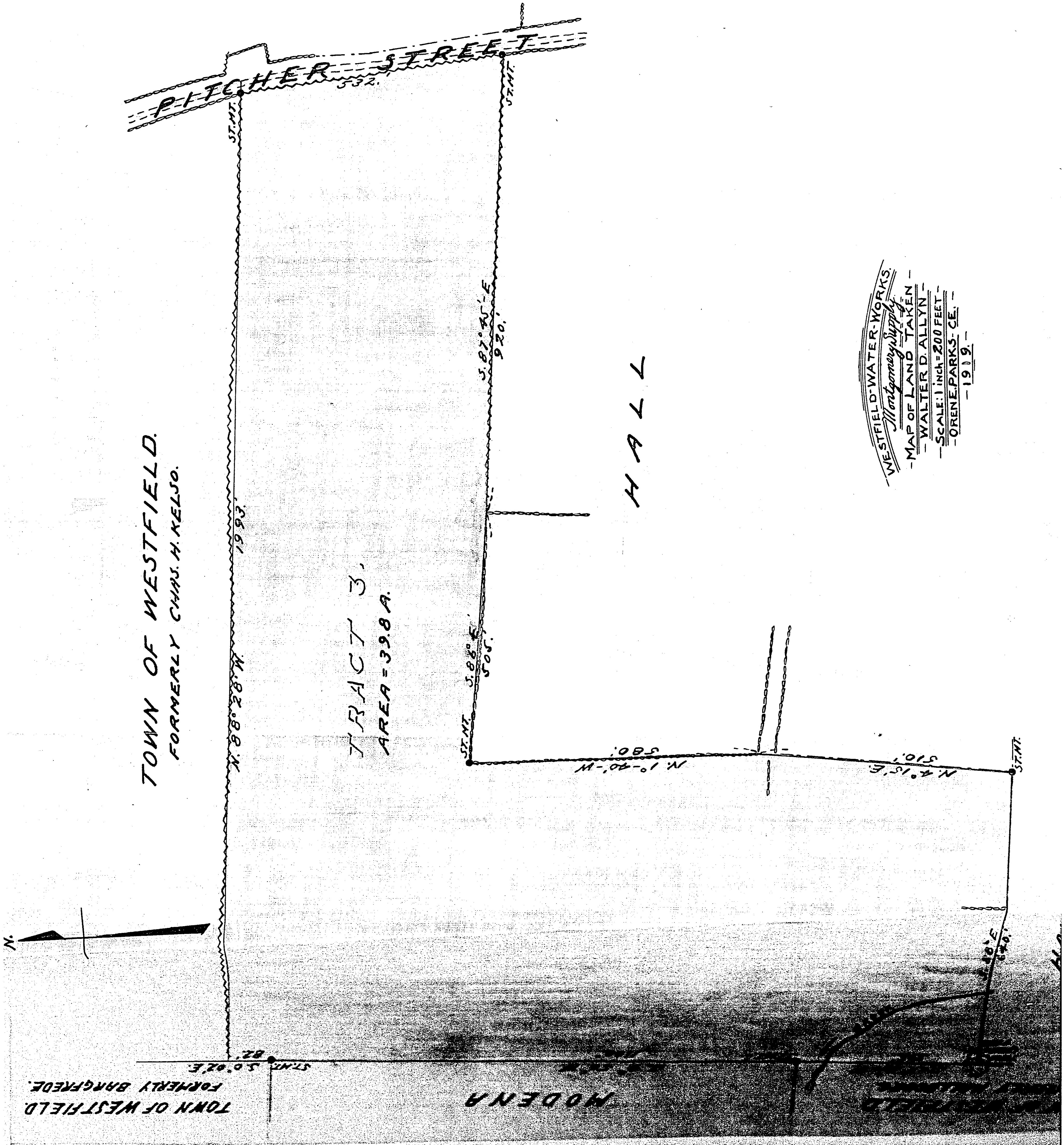
In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of
Water Commissioners.

H. C. Lane
Peter [illegible]
E. G. Clark

In the presence of John L. Hyde


D. L. ALLYN.
N.
MOOSE MEADOW POND
N. 89° 45' E.
860.'
ST. MT.
25'
ST. MT.
700.'
TRACT 1.
AREA = 10.35 A.
520.'
900.
MOORE HILL ROAD
900.
PITCHER STREET
Ir. Mt.
140.'
Ir. Mt.
TRACT 2.
AREA = 22.7 A.
1050.'
567.'
TOWN OF WESTFIELD
FORMERLY O. A. MOORE.
Ir. Mt.
ST. MT.
S. 69° 05' W
80'
415.'
S.-58° 40'-W
475.'
S-6° 03' E
30.'
N. 86° 25' W
ST. MT.
359.'
ST. MT.
TOWN OF WESTFIELD
FORMERLY CHAS. H. KELSO.
WESTFIELD-WATER-W
Montgomery Suppl
-MAP OF LAND TAKE
-WALTER D. ALLYN
-SCALE: 1 inch = 200 FEE
-OREN E. PARKS-C.E.-
-1919-


WESTFIELD-WATER-WORKS.
Montgomery Supply
-MAP OF LAND TAKEN-
-WALTER D. ALLYN-
-SCALE: 1 inch = 200 FEET-
-OREN E. PARKS- CE.-
-1919.-
PITCHER STREET
532'
ST.MT.
ST.MT.
S.87°45'E
920'
HALL
TOWN OF WESTFIELD.
FORMERLY CHAS. H. KELSO.
N.88°28'W.
1993'
TRACT 3.
AREA=39.8 A.
S.86°E
505'
ST.MT.
N.1°40'W
580'
N.4°15'E
510'
ST.MT.
S.40°E
620'
N.
ST.MT.
S.0°02'E.
82'
TOWN OF WESTFIELD.
FORMERLY BARGFREDE.
MODENA

(Walter D. Allyn)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefore, Know all Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this nineteenth day of May, in the year nineteen hundred and nineteen, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said land and property are situated in Montgomery in said County of Hampden, and are described as follows:-

Tract No. 1. Commencing at a point on the Westerly side of the highway known as Pitcher Street, at land supposed to belong to D. L. Allyn; thence Southerly along said highway about five hundred twenty (520) feet to the highway known as Moore Hill Road; thence Westerly along said road about nine hundred (900) feet to Moose Meadow Pond; thence Northerly along said pond about seven hundred (700) feet to land supposed to belong to D. L. Allyn; thence North 89° 45' East along said land of D. L. Allyn about twenty-five (25) feet to a stone monument; thence same course along said land of Allyn about eight hundred sixty (860) feet to place of beginning; containing about ten and thirty-five one-hundredths (10.35) acres.

Tract No. 2. Commencing at a stone monument on the westerly side of the highway known as Pitcher Street, at land of Town of Westfield, formerly of Charles H. Kelso; thence South 69° 05' West about eighty (80) feet; thence South 58° 40' West about four hundred seventy-five (475) feet; thence South 6° 03' East about thirty-eight (38) feet to a stone monument; thence North 86° 25' West about three hundred fifty-nine (359) feet to a stone monument at land of Town of Westfield, formerly of O. A. Moore, the last four courses being along land formerly of said Kelso; thence Northerly about four hundred fifteen (415) feet to an iron monument; thence Northerly about five hundred sixty-seven (567) feet to an iron monument; thence northerly about one hundred forty (140) feet to an iron monument on the southerly side of the highway known as Moore Hill Road, the last three courses being along land of Town of Westfield, formerly of O. A. Moore; thence Easterly along said road about nine hundred (900) feet to Pitcher Street, so called; thence Southerly along said street about ten hundred fifty (1050) feet to place of beginning; containing about twenty-two and seven-tenths (22.7) acres.

Tract No. 3. Commencing at a stone monument on the westerly side of the highway known as Pitcher Street, at land of Town of Westfield, formerly of Charles H. Kelso; thence North 88° 28' West along said land formerly of Kelso, about nineteen hundred ninety-three (1993) feet to other land of Town of Westfield, formerly of Anna C. S. Bargfrede; thence South 0° 02' East along said land formerly of Bargfrede, about eighty-two (82) feet to a stone monument at land supposed to belong to one Modena; thence South 0° 50' West along land of said Modena about eleven hundred (1100) feet to a stone monument at other land of Town of Westfield, formerly of Frank Hallbourg; thence South 2° 30' West along said land formerly of Hallbourg about three hundred ninety-five (395) feet to a twin chestnut tree at land supposed to belong to one Hall; thence South 88° East about six hundred forty (640) feet to a stone monument; thence North 4° 15' East about five hundred ten (510) feet; thence North 1° 40' West about five hundred eighty (580) feet to a stone monument; thence South 86° East about five hundred five (505) feet; thence South 87° 45' East about nine hundred twenty (920) feet to a stone monument on the westerly side of said highway known as Pitcher Street, the last five courses being along land supposed to belong to said Hall; thence Northerly along Pitcher Street about five hundred thirty-two (532) feet to place of beginning; containing about thirty-nine and eight-tenths (39.8) acres.

The foregoing described tracts are supposed to belong to Walter D. Allyn of Montgomery, Mass.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of
Water Commissioners

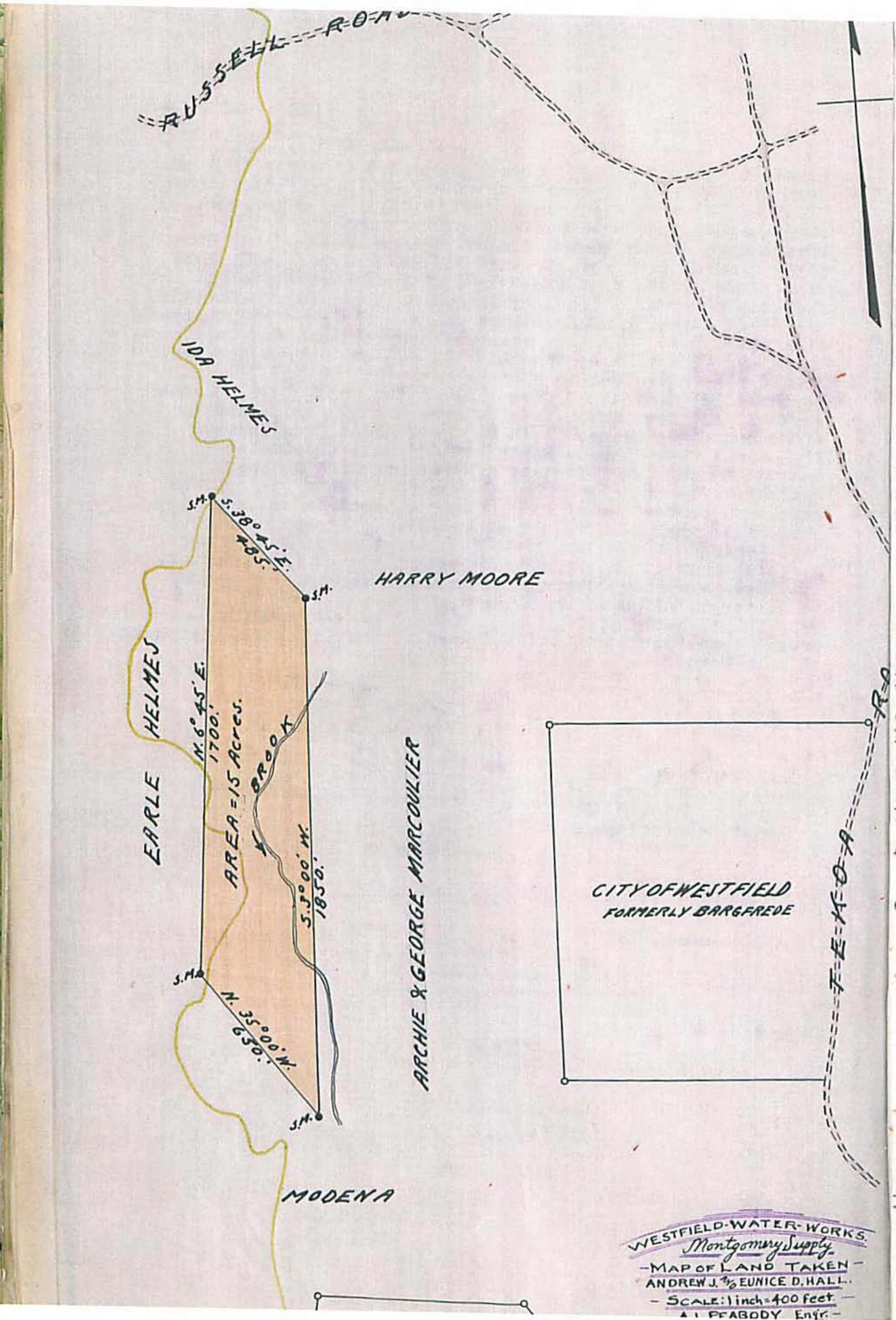
H. C. Lane
Peter Jensen
Edward G. Clark

In the presence of

Geo E. Parks

19881

HAMPDEN Co REGISTRY OF DEEDS
RECEIVED AND RECORDED
NOV 7 1919
AT 10 O'C 54 M a M



WESTFIELD-WATER-WORKS.
Montgomery Supply.
-MAP OF LAND TAKEN-
ANDREW J. and EUNICE D. HALL.
- SCALE: 1 inch = 400 feet. -
A L PEABODY Engr. -

(Andrew J. Hall & Eunice D. Hall)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the provisions of said Act:-

Now, therefore, Know All Men By These Presents, that the city of Westfield, acting through its Board of Public Works, to whom was conferred the powers and duties of the Water Commissioners of the town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this nineteenth day of December, in the year nineteen hundred and twenty-two, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said land and property are situated in Montgomery in said County of Hampden, and are described as follows:-

Commencing at a stone monument at the north-easterly corner of land supposed to belong to Earl Helmes and in the south-westerly line of land supposed to belong to Ida Helmes; thence turning South 38°45' East along land supposed to belong to Ida Helmes about 485 feet to a stone monument at land supposed to belong to Harry Moore; thence South 3° West along land supposed to belong said Harry Moore and along land supposed to belong to Arthur and George Marcoulier about 1850 feet to land supposed to belong to Modena; thence North 35° West along land supposed to belong to said Modena, about 650 feet to a stone monument at land supposed to belong to said Earl Helmes; thence North 6°45' East along land supposed to belong to said Earl Helmes about 1700 feet to the place of beginning; containing about 15 acres.

The foregoing described tract is supposed to belong to Andrew J. Hall and Eunice D. Hall of Montgomery, Mass.

In Witness Whereof, this instrument is signed by the Board of Public Works acting for said City of Westfield.

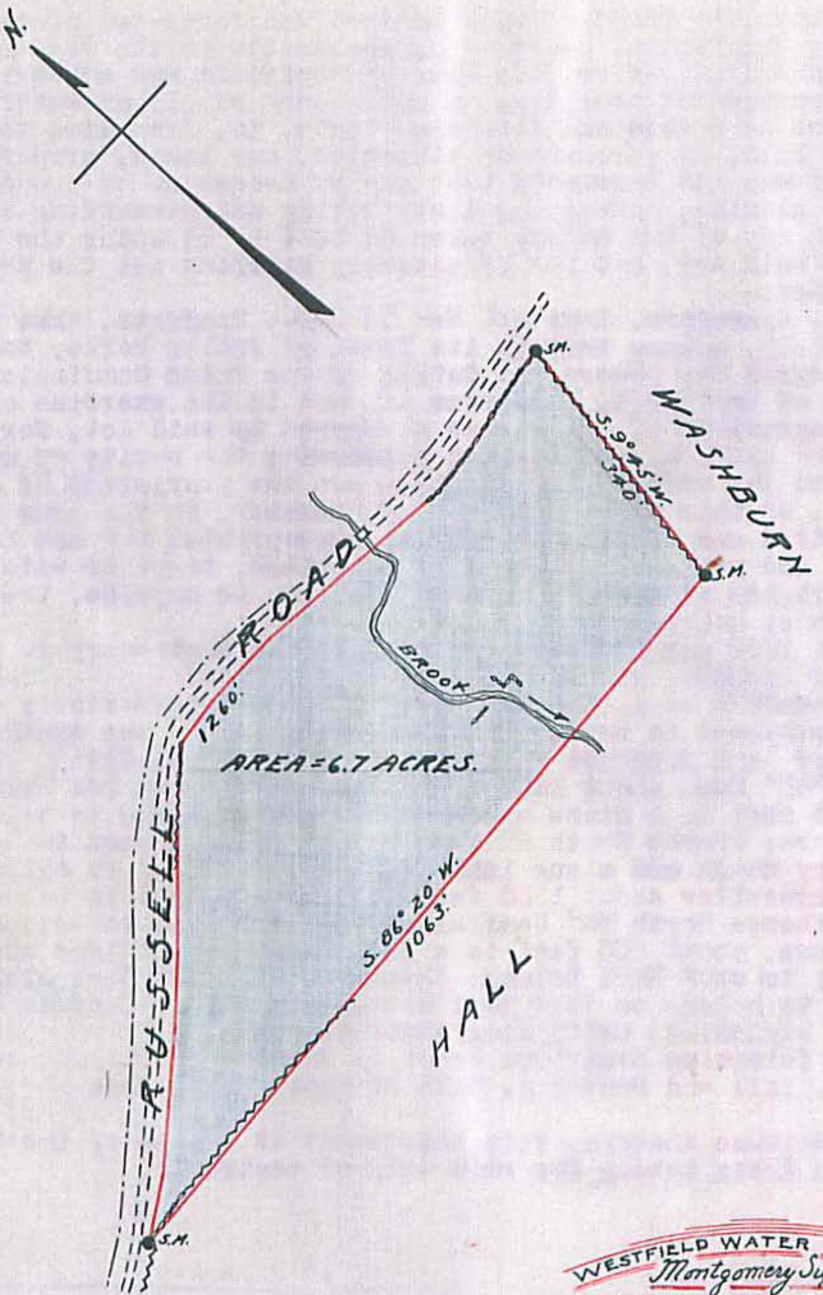
Board of
Public Works.

A. O. McKean
Peter Jensen

In the presence of

Ora E. Parks

20707
HAMPDEN CO. REGISTRY OF DEEDS
RECEIVED AND RECORDED
AUG 13 1923
AT 3 O'C. 05 M. P M



WESTFIELD WATER WORKS.
Montgomery Supply
- MAP OF LAND TAKEN -
- C.A. WILLIAMS. -
- SCALE: 1 INCH = 200 FEET -
- A.L. PEABODY - Eng'r. -
- 1923. -

(C. A. Williams)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the provisions of said Act:-

Now, therefore, Know All Men By These Presents, that the city of Westfield, acting through its Board of Public Works, to whom was conferred the powers and duties of the Water Commissioners of the Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this eleventh day of July, in the year nineteen hundred and twenty-three, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said land and property are situated in Montgomery in said County of Hampden, and are described as follows:-

Commencing at a stone monument on the southerly side of the Russell Road, sometimes called the "Old House Road", at northwest corner of land supposed to belong to one Washburn; thence running South 9°45' West along land of said Washburn about 340 feet to a stone monument at land of Andrew J. & Eunice D. Hall; thence South 66°20' West along said land of Andrew J. & Eunice D. Hall about 1063 feet to a stone monument on the southerly side of said Russell Road; thence northeasterly and easterly along said road about 1260 feet to place of beginning; containing about 6.7 acres.

The foregoing described tract is supposed to belong to C. A. Williams of Montgomery, Mass.

In Witness Whereof, this instrument is signed by the Board of Public Works acting for said City of Westfield.

Board of

Public Works

J. O. McKraus

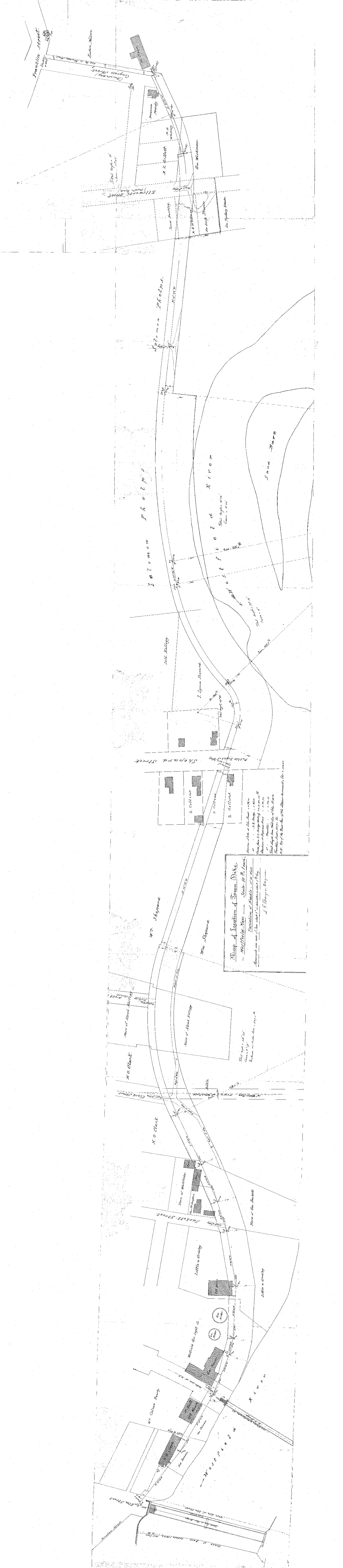
John L. Barry

In the presence of

Ann E. Parks

20708

HAMPDEN CO. REGISTRY OF DEEDS
RECEIVED AND RECORDED
AUG 13 1923
AT 3 O'C 05 M P M



Map of Location of Town Dike.

Westfield: Mass. — Scale: 50 ft. = 1 inch.

Variation of Needle: 10°28' West.

Monuments are rods of iron about 1" in diameter & about 3 ft. long

L. F. Thayer: Engineer.

Elevation of Dike at Elm Street = + 98.00
do. do. R.R. Bridge = + 96.00
Grade from R.R. Bridge Westerly +0.13 per 100 ft.
Elevation at Sheppard Street = + 98.72
do. do. Franklin do. = + 103.19
Total length from West line of Elm Street to Franklin Street = 5117.0 ft.
B.M. Top of the Base Stone of the Soldiers Monument, Elm Str. + 100.00

Total angle = 45°20'
Curve = 8°17'
Distance on Centre Line = 547.0 ft.

Springfield Oct 25th 1873,
Received and Registered in Hampden
Registry of Deeds Book 308. Page 346
By James E. Russell Register

Description &c.
of certain Lands taken by the Town
of Westfield
for Waterworks.

Rec'd Oct 25th 1873

Location of private Crossings

We fix and determine the number of private crossings over and along said Dike, and the place and manner in which, and the persons by whom said crossings shall be constructed and hereafter maintained as follows

No 1 A right of way along the Dike from Elm Street to the easterly end of H O Clarks factory building on the South side of the Dike about 110 feet from Elm Street, for the use of Mary Deneen and H O Clark and their heirs and assigns and any other person having a right of way over the passage way leading from Elm Street on the northerly line of H O Clark's Elm street lot and thence northerly to the Dike, There is also granted to H O Clark the right to construct and maintain a platform or Stairway, not exceeding 6 feet square on the northerly side and at the west end of the Johnson organ factory, Should the said factory be moved to the south side of the Dike, and located as shown on Tracing, the size and location of said platform being shown on said Tracing filed herewith

No 2 A right of way over said Dike between station 2+50 and 3+80 to William Calnan, Hiram Hale and H O Clark, their heirs and assigns, Said Hale to have the right of crossing for the use of his Ice business called Congreſs Street to a Stone monument on the westerly line of said private way. The lands taken on the South side from Station 45+2970 heretofore Mentioned to this point is 8 feet wide and on the north side 25 feet wide ~ The line heretofore described is a base line of Location the widths of lands taken are measured at right angles to this line on the northerly and Southerly side as Specified ~ Thence South 27° west 342 feet on said westerly line of private way to Franklin Street The land taken lies wholly on the Easterly side of said line and is 12 feet wide ~~ In addition to the land heretofore described the following described tract is hereby taken as a part of the land Embraced in this location commencing at a point in the Westerly line of Solomon Phelps lot and in the northerly line of the location heretofore described and running northerly on said Phelps line 100 feet to the northerly line of a lot belonging to Emily Brown thence westerly on Estate of George Mallory 127 feet to a private way called Ellsworth Street thence acroſs said Street on the same course to land belonging to George Workman thence Southerly on said Workman 66 feet to the — Northerly line of said location, thence Easterly on said location line to the place of beginning.

Lucius F. Thayer
David [illegible] } Special
Edward C. Carpenter Committee.

The Town of Westfield in accordance with the authority given by an act of the Legislature of Massachusetts entitled "an act to supply the Town of Westfield with pure water" approved May 29 1873 and for the purposes named in the 1st and 3d sections of said act have taken and do hereby take the following described land situate in Montgomery Hampden County Massachusetts. - said land lying southerly of the dwelling houses of Atwater Moore and Octerlony Moore and supposed to belong to Atwater Moore and Chelsea Upson. -

Commencing at a point in the Easterly line of Highway from Montgomery to Westfield (which runs near the Easterly side of Tekoa Mountain) and in the centre of a stone wall dividing mowing lot from pasture and southerly of the dwelling house owned by Atwater Moore, and running S 75° E along the centre of above mentioned wall 371 ft to the S.E. corner of said mowing lot. Thence N. 1 3/4° E along the line of the centre of wall on Easterly side of said mowing lot 417 ft to Stake & Stones 60 ft Northerly of N.E. corner of said mowing lot. Thence N 30¼° E 594 ft to Stake & Stones. Thence N 20¼° W 475 ft to Stake and Stones. Thence N 28¾° E 130 ft to Stake and Stones. Thence S 63° E 364 ft to Stake and Stones in old wall southerly of distillery. Thence S 81½° E 651 ft to Stake and Stones. Thence S 56½° E 273 ft to the corner of wall at the N.W. corner of lot owned by Chelsea Upson. For the above courses and distances the plot is bounded by land of Atwater Moore Thence from above mentioned corner along the centre of the fence between Moore and Upson S 84½° E 184 ft to Mill Privilege Thence along an irregular line, of fence mill, and face of dam about 447 ft to a Stake & Stone about 82 ft Easterly of the Easterly side of mill, bounded Northerly by said mill privilege. Thence S 13° W on land of said Upson 637 ft to Stake & Stones. Thence S 56½° W on land of said Upson to Stake and Stones in the fence between Moore and Upson. Thence N 80¾° W on land of

said Atwater Moore 690 ft to Stake and Stone near apple tree. Thence S 5½° W on said Moore 506 ft to Stake and said Atwater Moore 690ft to Stake and Stone near appletree. Thence S 5½° W on said Moore 506 ft to Stake and Stones. Thence S 30¾° W 215ft on said Moore to Stake and Stones about 50ft Easterly of Brook. Thence S 88½° W on said Moore across brook 205ft to a hole drilled in a large rock. Thence on said Moore N 35½° W 208ft to a point marked by a hole drilled in rock near marked tree. Thence N 19½° W 259 ft on said Moore to a point marked by a hole drilled in rock near marked tree. Thence N 60¼° W on said Moore 192 ft to Stake and Stone 33ft from S.E. corner of mowing lot described in 1st course and in line with 2d course. Thence N 75° W parallel with the first course 371 ft on said Moore to the Highway. Thence Northerly on Easterly line of Highway 33ft to place of beginning

Containing 51 Acres 153 rods more or less

Also the following described land lying in said Montgomery near Mount Tekoa and supposed to belong to the Elihu Gaylord Estate. –

Commencing at a Stone Monument supposed to be in the Town line between Westfield and Montgomery and 2 Rods Northerly and at Right angles to the direction of the fence between Edward Bancroft and the said Elihu Gaylord Estate and running N 5¼° W 847 ft on said Estate to stake and stones Thence N. 29¾° W 187 ft on said Estate to Birch Tree (marked). about 1 Rod Easterly of brook. Thence Northerly up the Stream on said Estate on a line one Rod Easterly from brook and parallel with brook about 60 Rods to the Easterly side of the Highway. Thence Southerly on Easterly line of Highway about 136 Rods to the N.W. corner of land owned by Edward Bancroft. Thence Easterly on the division line between said Estate and said Bancroft about 43 Rods to supposed Town line. Thence N 43° E about 2 Rods to place of beginning

The subscriber being a special committee duly chosen at a meeting of the inhabitants of the town of Westfield specially called for that purpose under and in pursuance of Chapter 150 of the Acts of the year 1879 having caused to be published for two successive weeks, to wit: on the ninth and sixteenth days of July A D 1879 in the Western Hampden Times and News Letter a notice of the time and place at which we would meet to fix and determine the location of said dike, and hear all parties in relation to the same and fix and determine the number of private crossings, and the place and manner in which, and the persons by whom, such crossings shall be constructed and thereafter maintained, did meet and hear all said parties who chose to be heard thereon at the time and place specified in said notice, and having adjourned from time to time to this Twenty fourth day of January A D 1880 do now fix and determine the location of said dike under the provisions of said Chapter 150 as follows

Commencing at a point $34\frac{75}{100}$ feet southerly of the face of the back wall of the southerly abutment of Great River Bridge, said point is in a line with the center line of said Bridge, thence north 37° 43' west to westerly line of Elm Street as laid by the County Commissioners August 14th 1879 $34\frac{84}{100}$ feet (Angle 67° 2' from the center line of Bridge and line last described) thence same course $18\frac{5}{10}$ feet. the land taken on the south side is 15 feet wide, the westerly line being parallel with Elm street Thence same course $92\frac{66}{100}$ feet, the land taken on the south side is 7 feet wide at the East End and 27 feet wide at this point, said East and west lines are parallel with Elm street Thence same course 20 feet the land taken on the south side is 8 feet wide on the East End and 6 feet wide at this point. The land taken on the north side from Elm street to this point Embraces all the land to the Westfield River

Thence same course 48 7/10 feet on old Dike and on land supposed to belong to H O Clark and Mrs Denien to an Iron monument at Station 2+14 7/10 as marked on the Tracing hereto annexed, Thence 7° 48' left North 45° 31' West 39 feet on the old Dike and land supposed to belong to said Clark and Denien. The land taken on the South side runs from the width of 6 feet heretofore described to a width of 18½ feet at this point, as shown on said Tracing, and on the North side all the land to the River - Thence same course 168 7/10 feet on old Dike and lands supposed to belong to said Clark, Denien Right of way William Calnan Hiram Hull and New Haven + Northampton Co to a point in the Center of the New Haven + Northampton Co's main Track 49 6/10 feet Southerly from the face of the south abutment at the level of the Bridge seat marked Station 4 + 22 7/10 as shown on said Tracing, The land taken on the south side runs from the width of 18½ feet heretofore described to a width of 20 feet at this point, on the Northerly side all the land to the Westfield River, Thence 8° 25' left North 53° 56' West 21 6/10 feet on land of New Haven + Northampton Co, The land taken on the South side runs from the width of 20 feet heretofore described to a width of 15 feet at this point. On the north side the width is 60 feet, Thence same course 45 4/10 feet on land of New Haven + Northampton Co and Westfield Gas Light Co and Old Dike —

The land taken on the South side runs from the width of 15 feet heretofore described to a width of 11 feet at this point, Thence same course $70\frac{4}{10}$ feet on Old Dike and land of said Gas Co to an Iron Monument, The land taken on the South side runs from the width of 11 feet heretofore described to a width of 19 feet at this point, Thence 8°.48' left North 62° 44' West $51\frac{9}{10}$ feet on said Gas Co and Old Dike to an Iron Monument, the land taken on the South side runs from the width of 19 feet heretofore described to a width of 17 feet at this point, Thence 9°25' left North 72°09' West $167\frac{7}{10}$ feet on said Old Dike and land of said Gas Co and Little & Gridley to an Iron Monument Opposite said Little & Gridley's Ice House, The land taken on the South side runs from the width of 17 feet heretofore described to a width of 22 feet at this point, The land taken on the north side of the line heretofore described, from the center of the New Haven & Northampton Co's Main Track to the last described point is 60 feet wide, Thence 12° 30' left. North 84°39' West $176\frac{4}{10}$ feet over Old Dike and land of Said Little & Gridley and Sackett Street to an Iron Monument, Thence 7°58' left South 87°23' west 99 feet over old Dike and land supposed to belong to the Heirs of George Sackett, Sackett Street so called and Thomas McLaughlin to an Iron Monument, Thence 5°54' left South 81°29' west $127\frac{8}{10}$ feet over Old Dike and land supposed to belong to said Heirs of George Sackett said McLaughlin Town of Westfield and John Dibble to an Iron Monument

Thence 2°24' left. South 79°05' 176 feet over old Dike and lands supposed to belong to said Dibble. H O Clark and Town of Westfield to an Iron monument at Station 13+58$\frac{8}{10}$ at the beginning of a curve to the right as shown on Tracing hereto annexed, Thence by an 8°17' curve (Radius 692$\frac{4}{10}$ feet) to the right 547 feet, (Total angle 45°20') over Old Dike said Clark. Clark Street Town of Westfield John Dibble Heirs of Alvah Kellogg and William Shepard to an Iron monument at Station 19+04$\frac{6}{10}$. Point Tangent. The width of land taken on the South side from the monument heretofore described opposite Little & Gridley's Ice House to the last named point is 22 feet wide. The land taken on the North side from said point at Ice House to said last named point is 60 feet wide; Thence on Tangent to said curve North 55°35' West 413$\frac{4}{10}$ feet over Old Dike and lands of said Shepard to land of Z Collins, The land taken on the South side from last described point at end of curve to this point is 18 feet wide and on the North side 50 feet wide. Thence same course on old Dike and said Collins 168 feet, The land taken on the South side is 18 feet wide and on the north runs from a width of 50 feet at East line of said Collins to a width of 15 feet at this point, Thence same course 9$\frac{2}{10}$ feet over Old Dike and said Collins to Shepard Street, The land taken on the South side is 18 feet wide and on the north side from the last named point the width is 15 feet; Thence same course 148$\frac{8}{10}$ feet over Old Dike Shepard Street and land supposed to belong to J Lyman Shepard to an Iron monument at the beginning of a curve to the left at Station 26+45 as shown on Tracing

Thence by a curve to the left; of 133$\frac{8}{10}$ feet Radius, over old Dike and land supposed to belong to said Shepard 144 feet to an Iron monument at Station 27+89. point of reverse curve (The total angle is 61°50' The distance measured on chord is 137$\frac{6}{10}$ feet) Thence by a 9° curve to the right, Radius 637$\frac{3}{10}$ feet, 359 feet, (Total angle 32°19') on land supposed to belong to said Shepard and Solomon Phelps to an Iron monument, Thence on a Tangent to said curve 85.06' west on land of said Phelp 75 feet to an Iron monument at the beginning of of a curve to the right at Station 32+23, Thence by a 3°24' curve to the right (Total angle 18°22', on said Phelps 540 feet to an Iron monument at Static 37+63., The land taken on the South side from the Eas line of Shepard Street to the last point is 20 feet wi and on the North side 100 feet wide, Thence by a Tangen Course North 66°44' west 616$\frac{7}{10}$ feet on land of said Phelps James Barkley and M B Whitney to an Iron monument at Station 43+79$\frac{7}{10}$ Thence by a 10°43' curve to the left (Radius 535$\frac{5}{10}$ feet) 150 feet on land of said Whitney a priv way called Ellsworth Street, George Workman and D L Gil to Station 45+29$\frac{7}{10}$, The land taken on the South side fr Station 37+63 before mentioned to this point is 20 fe wide and on the north side 25 feet wide, Thence by th same curve 130 feet over lands of said Gillett, Whitney, Workman and Dennis Murphy to an Iron Monume (Total angle 30°) Thence on a Tangent North 83°20' wes 150 feet on land of said Murphy and a private way

Also a strip of land situate in Westfield in Said County and described as follows Commencing at the stone monument described at the beginning of the above description and running Easterly on a line 33ft from a line between said Estate and Bancroft and parallel thereto about 15 rods to the Westerly line of the Highway Thence Southerly about 2 rods on Highway to said division line. Thence Westerly on said division line about 15 Rods to supposed Town line. Thence N43° E about 2 rods to place of beginning

containing a total area in the two last described pieces of land of 17 Acres more or less

Variation of the Needle 8° 54' West.

Lewis F Root Eng

Reuben Noble
Saml. Horton
Wm. Stiles Bush
Lucius R Norton

Water Commissioners For the Town of Westfield

Westfield Water Works - Granville Supply - Description of Land Taken & Location Maps - 1898

1898 Reports

"Westfield Water Works - Granville Supply - Description of Lands Taken and Location Maps 1898".
Filed Hampden County Registry of Deeds Document #2548 April 5, 1898, James R. Wells, Register.
Chapter 342 Acts 1895. See also: Hampden County Registry of Deeds Book 631, Page 122.

Bridges	Cowle's Bridge
City/Town	Southwick
City/Town	Westfield
City/Town	Granville
Name	Crane, Robert B
Name	Jensen, Marius
Name	Warner
Name	Hollister, Hubbard
Name	Delmar
Name	Rowley
Name	Pendleton, Benjamin E
Name	Arnold, Warren D
Name	Henrickson, Peter
Name	Bruch, A J
Name	Leahey, William J
Name	Birge, Eli
Name	Fowler, Morton J

Name	Sackett, Enoch
Name	Provost, Mary
Name	Loomis, George B
Name	Kellogg, L C
Name	Nelson, Robert
Name	Sampson, George C
Name	Purchase, Elvira
Name	Arnold, Michael
Name	Crane, James A
Name	Strong, George
Name	Benton, Mary A
Name	Lamson, F D
Name	Winchell, Henry
Name	Strong, Carlton
Name	Rowley, Christina
Name	McElligott, John
Name	Plumley, Isaac
Name	Hallbourg, Frank
Name	Marcouillier, Celina
Name	Hendrickson, Peter
Name	Sullivan, J J
Name	Pearsons, Sara E

Name	Stiles, Lucy M
Name	Stiles, Jerome B
Name	Holcomb, William
Name	Frost, Harriet M
Name	Provost, Moses
Name	Gutierrez, Florence
Name	Hunt
Name	Winchell, Luke
Name	Harrington, John
Name	Fowler, Jospeh J
Name	Brown, Lucy M
Name	Andrews, James H
Name	Searle, William E
Name	Jensen, Jens
Name	Sanderson
Name	Cooley, Ralph
Streets	Mill Street
Streets	Fowler Road
Streets	City View Boulevard
Streets	South Maple Street
Streets	Sackett Road
Streets	West Granville Road

WESTFIELD WATER WORKS
GRANVILLE SUPPLY
DESCRIPTION OF LANDS TAKEN
AND LOCATION MAPS

1898

2548

HAMPDEN COUNTY REGISTRY OF DEEDS.

APR 5 1898

Received 2 H. 35 M. P.M.

Rec. and Filed

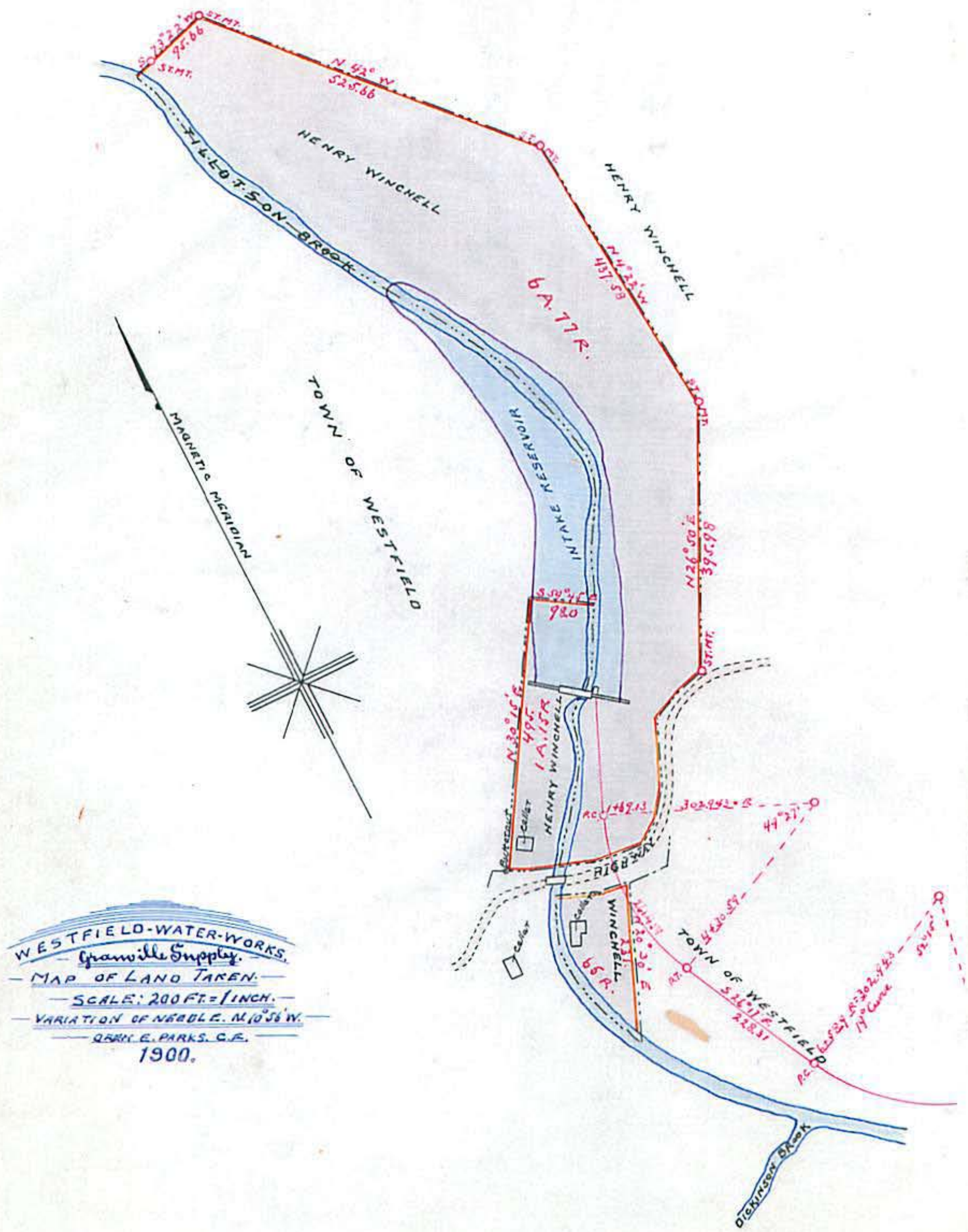
Attest James R. Wells Register

WESTFIELD WATER WORKS

GRANVILLE SUPPLY

DESCRIPTION OF LANDS TAKEN
AND LOCATION MAPS

1898.



WESTFIELD-WATER-WORKS.
Granville Supply.
MAP OF LAND TAKEN.
SCALE: 200 FT. = 1 INCH.
VARIATION OF NEEDLE. N.10°56'W.
OSCAR E. PARKS. C.E.
1900.

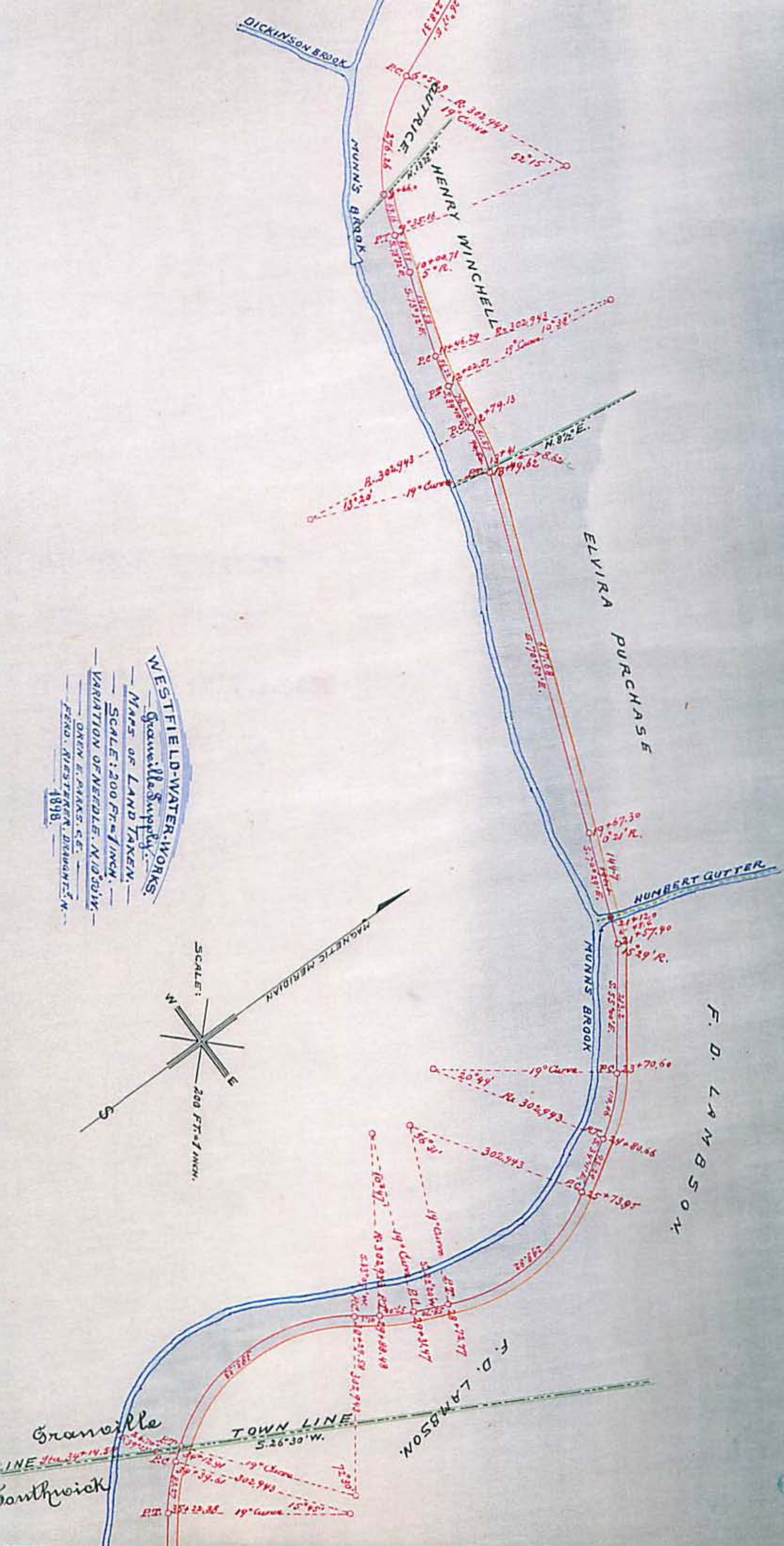
WESTFIELD WATER WORKS. GRANVILLE SUPPLY.

DESCRIPTION OF LAND.

Know All Men that the Town of Westfield in the County of Hampden and Commonwealth of Massachusetts, in the exercise of powers conferred by Chapter three hundred and forty-two of the Acts of the year Eighteen Hundred and Ninety-five, being an Act entitled "An Act to authorize the Town of Westfield to increase its Water Supply", and approved April 30th.1895, has by its Water Commissioners, for the purpose of supplying the inhabitants of said Town with pure water for the extinguishment of fires and for domestic and other purposes, taken the right to lay and maintain water mains and replace the same and keep the same in repair within certain tracts or parcels of land situated, bounded and described as follows:

One certain tract of land situated in Granville in said County, supposed to belong to HENRY WINCHELL, and described as follows:

Commencing at a stake, supposed to be in the division line between land of Florence Gutierrez and land of Henry Winchell, Sta. 8+66 of location line of Westfield Water Main, and running on a 19° curve to left (radius 302.943 ft.) a distance of about sixty-nine and sixteen hundredths (69.16) feet to a stake Sta. 9+35.16. Thence on course S.78°32'E. a distance of about sixty-five and fifty-five hundredths (65.55) feet, to a stake Sta. 10 +00.71, thence on an angle of 5° to the right course S. 73°32'E. a distance of about one hundred forty-five and fifty-eight hundredths (145.58) feet to a stake Sta. 11+46.29, thence on a 19° curve left (radius 302.943 ft.) a distance of about fifty-six and twenty-two hundredths (56.22) feet. Thence tangent course S. 84°10'E. a distance of about seventy-six and sixty-two hundredths (76.62) feet to a stake Sta. 12+79.13. Thence on a 19° curve right (radius 302.943 ft.) a distance of about sixty-one and eighty-seven hundredths (61.87) feet to a stake Sta. 13+ 41 a point supposed to be in division line between land of Henry


WESTFIELD-WATER-WORKS.
—Granville Supply.—
—MAPS OF LAND TAKEN.—
—SCALE: 200 FT.=1 INCH.—
—VARIATION OF NEEDLE. N.10°30'W.—
—OREN E. PARKS, C.E.—
—FERD. RIESTERER, DRAUGHTS.N.—
—1898.—
DICKINSON BROOK
MUNN'S BROOK
GUTRICE
HENRY WINCHELL
ELVIRA PURCHASE
HUMBERT GUTTER
F. D. LAMBSON
F. D. LAMBSON.
MAGNETIC MERIDIAN
SCALE:
200 FT.=1 INCH.
W
E
S
TOWN LINE
S.26°30'W.
Granville
Southwick
LINE
N.8½°E.
19° Curve
R. 302.943
52°15'
13°20'
20°49'
38°30'
10°38'
15°45'
+67.30
0°31'R.
21+57.90
15°29'R.
23+70.60
24+80.66
25+73.95
18+49.62
12+79.13
P.C.
P.T.

Winchell and land of Elvira Purchase.

The above description is for the center line of location, the whole length on center line being about four hundred seventy-five (475.0) feet. The width of land taken being one rod on the left or northerly side of said center line and all the land to right between center line and Munns Brook, meaning to cover all land lying between the above described division lines and line parallel with and one rod left of said Center line and Munns Brook, containing about one hundred and sixteen (116.0) square rods more or less.

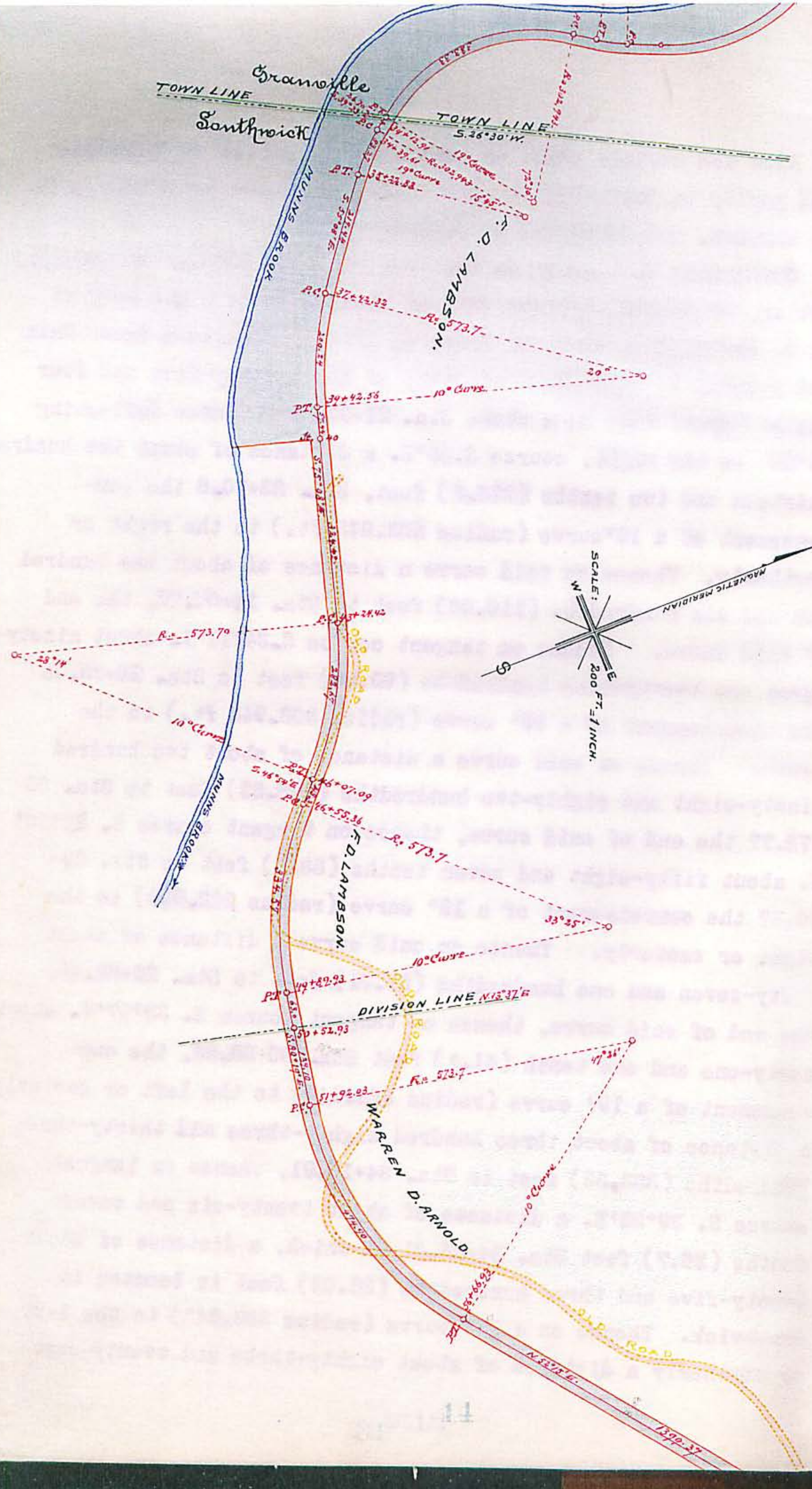
Also one certain tract of land, situated in Granville supposed to belong to ELVIRA PURCHASE, and described as follows:

Commencing at a stake supposed to be in the division line between land of Henry Winchell and land of Elvira Purchase, Sta. 13+41 of location line of Westfield Water Main, thence on a 19° curve (radius 302.943 ft.) to the right a distance of about eight and sixty-two hundredths (8.62) feet to a stake Sta. 13+49.62, thence on tangent S. 70° 50'E. a distance of about six hundred seventeen and sixty-eight hundredths (617.68) feet to a stake Sta. 19+67.30, thence on an angle to right, course S. 70°29'E. to a Stake Sta. 21+12, a distance of about one hundred forty-four and seven tenths (144.7) feet, a point in center of Humberts Gutter, so called, and in supposed division line, between land of Elvira Purchase and land of F. D. Lambson.

The above description is for the center line of said location the whole length on center line being about seven hundred seventy-one (771.0) feet. The width of land taken being one rod on the left or northerly side of said center line, and all the land to the right of said center line, or southerly, to Munns Brook, so called, meaning to cover all land lying between the above described division lines and linesparallel with and one rod on the left of said center and Munns Brook, so called, containing one acre and twenty-eight and three tenths (one acre 28.3) square rods more or less.

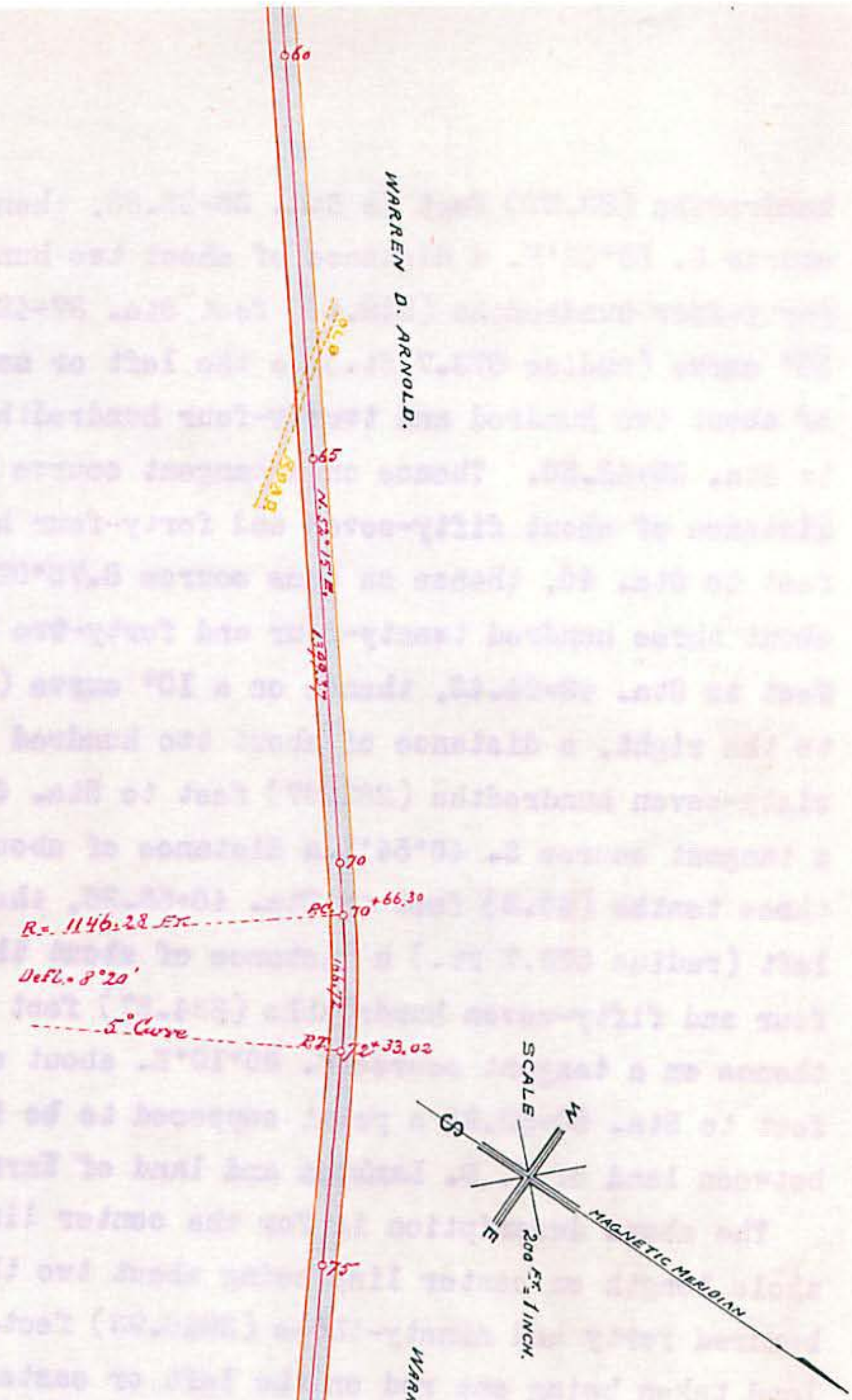
Also one certain tract of land situated partly in Granville and partly in Southwick in said County, supposed to belong to F. D. LAMBSON, and described as follows:

Commencing at a point in the division line (center of Humberts Gutter, so called) between land of Elvira Purchase and land of F. D. LambsonSta. 21+12 of location line of Westfield Water Main and running S. 70°29'E. a distance of about forty-five and four tenths (45.4) feet to a stake Sta. 21+57.4. Thence deflecting 15°29' to the right, course S.55°E. a distance of about two hundred thirteen and two tenths (213.2) feet, Sta. 23+70.6 the commencement of a 19°curve (radius 302.943 ft.) to the right or southerly. Thence on said curve a distance of about one hundred ten and six hundredths (110.06) feet to Sta. 24+80.66, the end of said curve. Thence on tangent course S.34°11'E. about ninety-three and twenty-nine hundredths (93.29) feet to Sta. 25+73.95 the commencement of a 19° curve (radius 302.943 ft.) to the south. Thence on said curve a distance of about two hundred ninety-eight and eighty-two hundredths (298.82) feet to Sta. 28+72.77 the end of said curve, thence on tangent course S. 22°20' W. about fifty-eight and seven tenths (58.7) feet to Sta. 29+31.47 the commencement of a 19° curve (radius 302.943) to the right or westerly. Thence on said curve a distance of about fifty-seven and one hundredths (57.01) feet to Sta. 29+88.48, the end of said curve, thence on tangent course S. 33°07'W. about forty-one and one tenth (41.1) feet Sta. 30+29.58, the commencement of a 19° curve (radius 302.943) to the left or easterly thence on said curve a distance of about three hundred eighty-three and thirty-three hundredths (383,33) feet to Sta. 34+12.91, thence on tangent course S. 39°23'E. a distance of about twenty-six and seven tenths (26.7) feet Sta. 34+39.61 of which, a distance of about twenty-five and three hundredths (25.03) feet is located in Southwick. Thence on a 19° curve (radius 302.943) to the left or northerly a distance of about eighty-three and twenty-seven


Granville
TOWN LINE
Southwick
TOWN LINE
S.26°30'W.
P.T.
P.C.
34+12.91
34+39.61
19° Curve
R=302.943
19° Curve
15°45'
72°30'
P.T.
35+22.88
MUNNS BROOK
F. D. LAMBSON.
P.C.
37+42.32
R=573.7
20°
10° Curve
P.T.
39+42.56
40
SCALE:
200 FT.=1 INCH.
MAGNETIC MERIDIAN
W
E
S
P.C.
43+24.42
R.= 573.70
28°14'
OLD ROAD
10° Curve
P.T.
46+07.09
S.48°54'E.
P.C.
46+55.36
R.=573.7
MUNNS BROOK
F.D. LAMBSON.
334.57
33°25'
10° Curve
P.T.
49+89.93
DIVISION LINE N.15°37'E
50+52.93
S.80°19'E.
139.10
R= 573.7
47°31'
51+92.03
P.C.
WARREN D. ARNOLD.
10° Curve
474.90
56+66.93
P.T.
OLD ROAD
N.53°15'E.
1390.37

hundredths (83.27) feet to Sta. 35+22.88, thence on a tangent course S. 55°08'E. a distance of about two hundred nineteen and forty-four hundredths (219.44) feet to Sta. 37+42.32, thence on a 10° curve (radius 573.7 ft.) to the left or northerly a distance of about two hundred and twenty-four hundredths (200.24) feet to Sta. 39+42.56. Thence on a tangent course S. 75°08'E. a distance of about fifty-seven and forty-four hundredths (57.44) feet to Sta. 40, thence on same course S.75°08'E. a distance of about three hundred twenty-four and forty-two hundredths (324.42) feet to Sta. 43+24.42, thence on a 10° curve (radius 573.7 ft.) to the right, a distance of about two hundred eighty-two and sixty-seven hundredths (282.67) feet to Sta. 46+07.09, thence on a tangent course S. 46°54'E.a distance of about forty-eight and three tenths (48.3) feet to Sta. 46+55.36, thence on a 10° curve left (radius 573.7 ft.) a distance of about three hundred thirty-four and fifty-seven hundredths (334.57) feet to Sta. 49+89.93, thence on a tangent course S. 80°19'E. about sixty-three (63.0) feet to Sta. 50+52.93 a point supposed to be in the division line between land of F. D. Lambson and land of Warren D, Arnold.

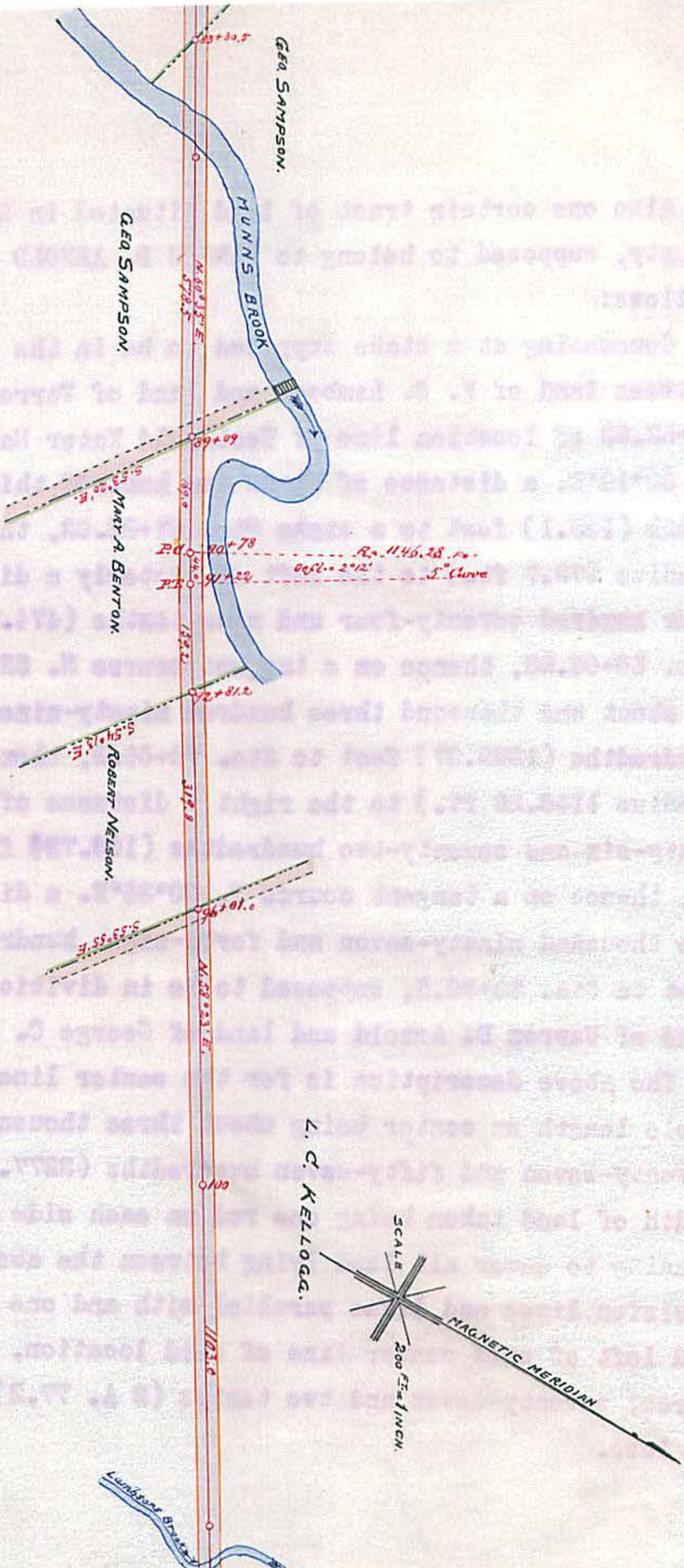
The above description is for the center line of location, the whole length on center line being about two thousand nine hundred forty and ninety-three (2940.93) feet. The width of land taken being one rod on the left or easterly and northerly side and from Sta. 40or a distance of about one thousand fifty-two and ninety-three (1052.93) hundredths feet to Sta. 50+52.93 one rod on the right or southerly side of said location and from Sta. 21+12 to Sta. 40, a distance of about one thousand eight hundred eighty-eight (1888.0) feet, all the land southerly and westerly of said location line to Munns Brook. Containing five acres and sixty-five and eight tenths (5 acres 65.8) square rods more or less.


60
WARREN D. ARNOLD.
SPAR
Old
65
N.52°15'E.
1328.47
70
R.= 1146.28 Ft.
PC. 70+66.30
Defl.= 8°20'
5° Curve
PT. 72+33.02
166.72
SCALE
200 Ft. = 1 INCH.
MAGNETIC MERIDIAN
W
S
E
75
WARREN D. ARNOLD
N.60°35'E.
1007.48
80
S.74°44'E.
DIV. FENCE
83+30.5
Geo. SAMPSON.
MUNN'S BR.
85

Also one certain tract of land situated in Southwick in said County, supposed to belong to WARREN D. ARNOLD and described as follows:

Commencing at a stake supposed to be in the division line between land of F. D. Lambson and land of Warren D. Arnold, Sta. 50+52.93 of location line of Westfield Water Main, thence running S. 80°19'E. a distance of about one hundred thirty-nine and one tenth (139.1) feet to a stake Sta. 51+92.03, thence on a 10° curve (radius 573.7 ft.) to the left or easterly a distance of about four hundred seventy-four and nine tenths (474.9) feet to a stake Sta. 56+66.93, thence on a tangent course N. 52°15'E. a distance of about one thousand three hundred ninety-nine and thirty-seven hundredths (1399.37) feet to Sta. 70+66.3, thence on a 5° curve (radius 1146.28 ft.) to the right a distance of about one hundred sixty-six and seventy-two hundredths (166.72) feet to Sta. 72+33.02, thence on a tangent course N. 60°35'E. a distance of about one thousand ninety-seven and forty-eight hundredths (1097.48) feet to Sta. 83+30.5, supposed to be in division line between land of Warren D. Arnold and land of George C. Sampson.

The above description is for the center line of location, the whole length on center being about three thousand two hundred seventy-seven and fifty-seven hundredths (3277.57) feet. The width of land taken being one rod on each side of said center line meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said center line of said location, containing two acres, seventy-seven and two tenths (2 A. 77.2) square rods more or less.


Geo. Sampson.
83+30.5
Munns Brook
N.60°35'E.
578.5
Geo. Sampson.
89+09
S.53°08'E.
40.9
Mary A. Benton.
P.C.
90+78
44.0
R.=1146.28 ft.
Defl.=2°12'
5° Curve
P.T.
91+22
139.2
92+81.2
S.54°13'E.
Robert Nelson.
317.8
96+81.0
S.53°55'E.
N.58°23'E.
L. C. Kellogg.
100
1103.C
Scale
200 Ft.=1 Inch.
Magnetic Meridian
Brook
107+04
S.34°45'E.
Geo. B. Loomis.

Also one certain tract of land situated in Southwick in said County supposed to belong to George C. Sampson, and described as follows:

Commencing at a stake supposed to be in the division line between land of Warren D. Arnold and land of George C. Sampson Sta. 83+30.5 on location line of Westfield Water Main and running N. 60°35'E. a distance of about five hundred seventy-eight and five tenths(578.5) feet to Sta. 89+09.0 a point supposed to be in division line between land of George C. Sampson and land of Mary A. Benton.

The above description is for the center line of said location, the whole length on center being about five hundred seventy-eight and five tenths (578.5) feet. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said center line of said location, containing about seventy and one tenth (70.1) square rods more or less.

Also one certain tra~~r~~ct of land situated in Southwick in said County, supposed to belong to MARY A, BENTON, and described as follows:

Commencing at a stake supposed to be in the division line between land of George C. Sampson and land of Mary A. Benton, Sta. 89+09.0 on location line of Westfield Water Main and running N. 60°35'E. a distance of about one hundred sixty-nine (169.0) feet to a stake Sta. 90+78. Thence on a 5° curve (radius 1146.28 feet) to the left a distance of about forty-four (44.0) feet to a stake Sta. 91+22, thence on tangent course N. 58°23'E. a distance of about one hundred fifty-nine and two tenths (159.2) feet to stake Sta. 92+81.2 a point supposed to be in the division line between land of Mary A. Benton and land of Robert Nelson.

The above description is for the center line of said location, the whole length on center being about three hundred seventy-two and two tenths (372.2) feet. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said center line of location containing about forty-five and one tenth (45.1) square rods more or less.

Also one certain tract of land situated in Southwick in said County, supposed to belong to ROBERT NELSON, and described as follows:

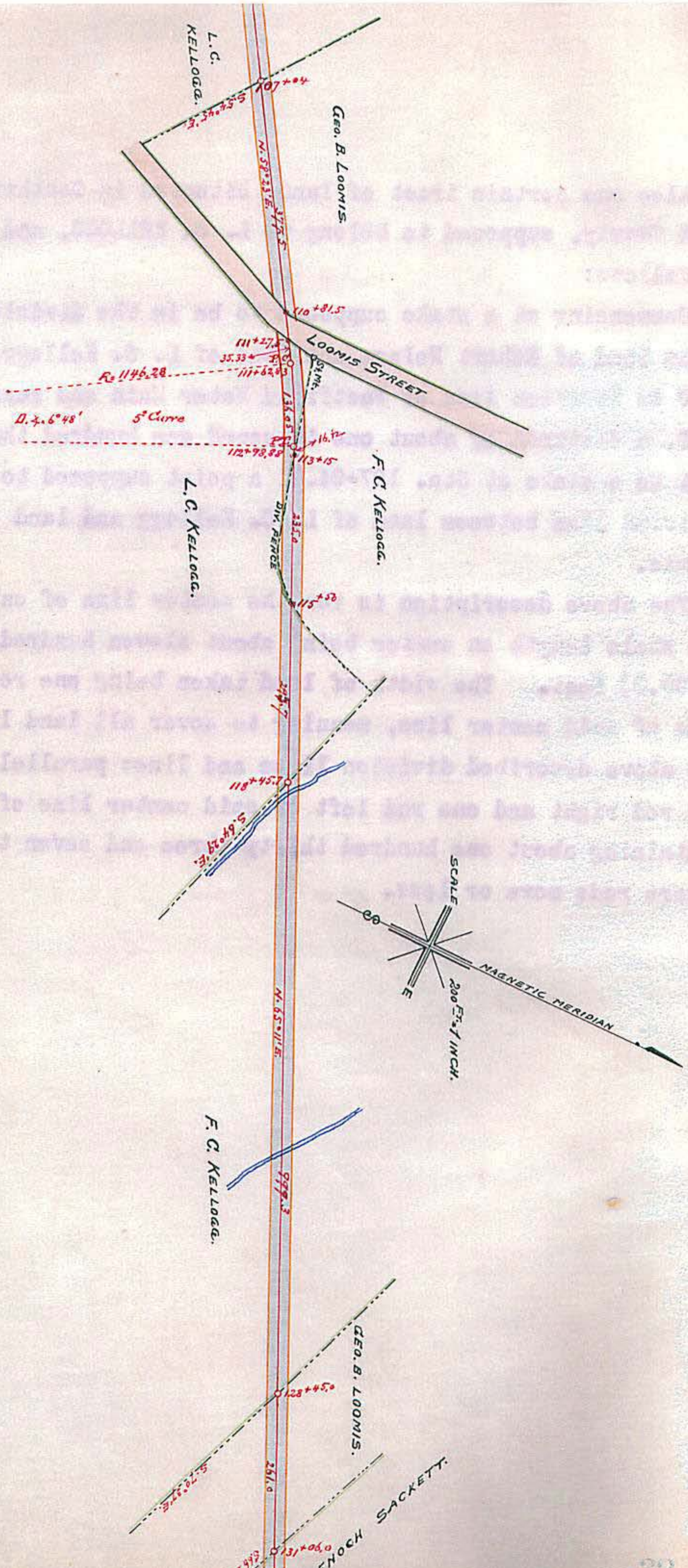
Commencing at a stake supposed to be in the division line between land of Mary A. Benton and land of Robert Nelson, Sta. 92+81.2 of location line of Westfield Water Main, and running N. 58°23'E. a distance of about three hundred nineteen and eight tenths (319.8) feet, to a stake at Sta. 96+01.0 a point supposed to be in the division line between land of Robert Nelson and land of L. C. Kellogg.

The above description is for the center line of said location the whole length on center being about three hundred nineteen and eight tenths (319.8) feet. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said center line of said location, containing about thirty-eight and seven tenths (38.7) square rods more or less.

Also one certain tract of land, situated in Southwick in said County, supposed to belong to L. C. KELLOGG, and described as follows:

Commencing at a stake supposed to be in the division line between land of Robert Nelson and land of L. C. Kellogg, Sta. 96+01.0 on location line of Westfield Water Main and running N. 58° 23'E. a distance of about one thousand one hundred three (1103.0) feet to a stake at Sta. 107+04.0, a point supposed to be in the division line between land of L. C. Kellogg and land of George B. Loomis.

The above description is for the center line of said location the whole length on center being about eleven hundred three (1103.0) feet. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said center line of location containing about one hundred thirty-three and seven tenths (133.7) square rods more or less.


L.C. KELLOGG.
107+04
S.54°45'E.
GEO. B. LOOMIS.
N.59°23'E.
377.5
110+81.5
111+27.5
35.33
P.C.
111+62.63
R=1146.28
LOOMIS STREET
St.Mk.
D.<.6°48'
5° Curve
136.05
P.T.
16.12
112+98.88
113+15
F.C. KELLOGG.
L.C. KELLOGG.
DIV. FENCE
235.0
115+52
297.7
118+45.7
S.64°29'E.
SCALE
200 Ft.=1 INCH.
MAGNETIC MERIDIAN
E
N.65°11'E.
999.3
F.C. KELLOGG.
GEO. B. LOOMIS.
128+45.0
S.72°02'E.
261.0
ENOCH SACKETT.
131+06.0
S.64°23'E.

Also one certain tract of land, situated in Southwick in said County, supposed to belong to GEORGE B. LOOMIS, and described as follows:

Commencing at a stake supposed to be in the division line between land of L. C. Kellogg and land of George B. Loomis, Sta. I07+04 on locationline of Water Main, thence N. 58°23'E. a distance of about three hundred seventy-seven and five tenths (377.5) feet to stake at Sta. 110+81.5 a point supposed to be in the westerly line of Loomis Street.

The above description is for the center line of said location, the whole length on center line being about three hundred seventy seven and five tenths feet (377.5). The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division line and westerly line of Loomis Street, so called, and lines parallel with and one rod right and one rod left of said center line of said location, containing forty six and six tenths (46.6) square rods more or less.

Also one certain tract of land situated in Southwick in said County, supposed to belong to L. C. KELLOGG, and described as follows:

Commencing at a stake supposed to be in the easterly line of Loomis Street, so called,(Sta.111+27.5 on the location line of Westfield Water Main and running N.58°23'E. a distance of about thirty-five and thirty-three hundredths (35.33) feet to a stake Sta.111+62.83, thence on a 5° curve right (radius 1146.28 ft.) a distance of about one hundred thirty-six and five hundredths (136.05) feet to a stake Sta. 112+98.88, thence on a tangent course N. 65°11'E. a distance of about sixteen and twelve hundredths (16.12) feet, to a stake Sta. 113+15, a point supposed to be in the division line between land of L. C. Kellogg and land of F. C. Kellogg.

The above description is for the center line of said location, the whole length on center line being about one hundred eighty-seven and five tenths (187.5) feet. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the easterly line of Loomis Street, the above described division line and lines parallel with and one rod right and one rod left of said center line of said location, containing about twenty-two and seven tenths (22.7) square rods more or less.

Also one certain tract of land situated in Southwick in said County and supposed to belong to F. C. KELLOGG, and described as follows:

Commencing at a stake supposed to be in the division line between land of L. C. Kellogg and land of F. C. Kellogg, Sta. 113 +15, on location line of Westfield Water Main, and running N.65° 11'E. a distance of about two hundred thirty-five (235.0) feet to a stake, Sta.115+50, a point supposed to be in the division line between land of L. C. Kellogg and land of F. C. Kellogg.

The above description is for the center line of said location, the whole length on center line being about two hundred thirty-five (235.0) feet. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said center line of said location, containing twenty-eight and four tenths (28.4) square rods more or less.

Also one certain tract of land situated in Southwick in said County supposed to belong to L. C. KELLOGG, and described as follows:

Commencing at a stake supposed to be in the division line between land of F. C. Kellogg and land of L. C. Kellogg, Sta. 115 +50 on location line of Westfield Water Main, and running N. 65° 11'E. a distance of about two hundred ninety-five and seven tenths (295.7) feet to a stake, Sta. 118 +45.7 a point supposed to be in the division line between land of L. C. Kellogg and land of F. C. Kellogg.

The above description is for the center line of said location, the whole length on center line being about two hundred ninety-five and seven tenths (295.7) feet. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said center line of location, containing about thirty-five and eight tenths (35.8) square rods more or less.

Also one certain tract of land situated in Southwick, in said County, supposed to belong to F. C. KELLOGG, and described as follows:

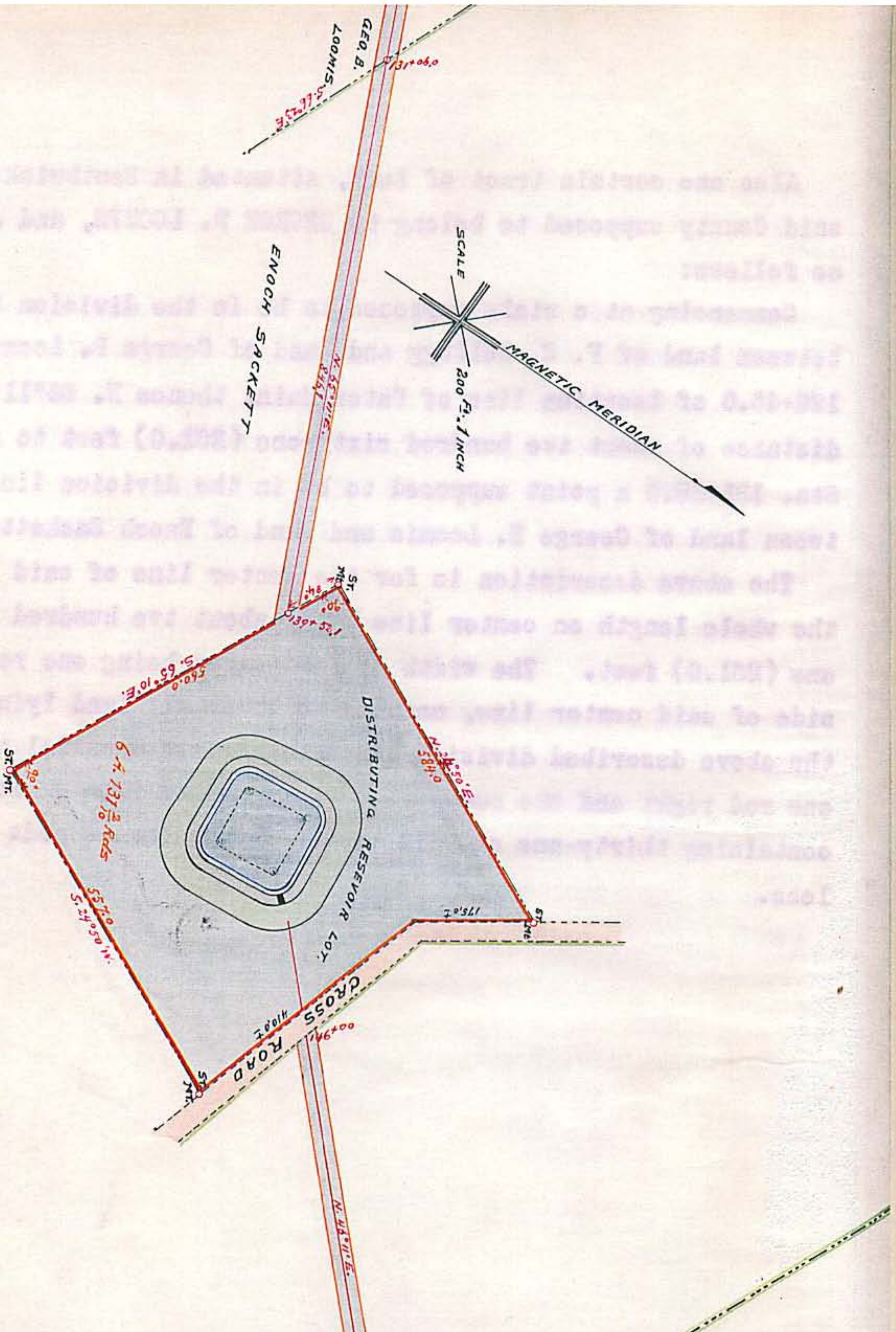
Commencing at a stake supposed to be in the division line between land of L. C. Kellogg and land of F. C. Kellogg, Sta. 118+45.7 on location line of Westfield Water Main and running N. 65°11'E. a distance of about nine hundred ninety-nine and three tenths (999.3) feet to a stake Sta. 128+45, a point supposed to be in the division line between land of F. C. Kellogg and land of George B. Loomis,

The above description is for the center line of said location the whole length on center line being about nine hundred ninety-nine and three tenths (999.3) feet. The width of land taken be- one rod on each side of said center line meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said center line of location, containing about one hundred twenty-one and one tenth (121.1) square rods more or less.

Also one certain tract of land, situated in Southwick in said County supposed to belong to GEORGE B. LOOMIS, and described as follows:

Commencing at a stake supposed to be in the division line between land of F. C. Kellogg and land of George B. Loomis Sta. 128+45.0 of location line of Water Main, thence N. 65°11'E. a distance of about two hundred sixty-one (261.0) feet to a stake Sta. 131+06.0 a point supposed to be in the division line between land of George B. Loomis and land of Enoch Sackett.

The above description is for the center line of said location, the whole length on center line being about two hundred and sixty-one (261.0) feet. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division lines, and lines parallel with and one rod right and one rod left of said center line of location, containing thirty-one and six tenths (31.6) square rods more or less.


GEO. B. LOOMIS
S. 66°25'E.
131+06.0
SCALE
200 FT. = 1 INCH
MAGNETIC MERIDIAN
ENOCH SACKETT
N. 55°11'E.
824.1
ST. MT.
84'
90°
139+52.1
S. 65°10'E.
560.0
N. 24°50'E.
584.0
DISTRIBUTING RESEVOIR LOT.
6 A. 137 3/10 Rods
ST. MT.
90°
557.0
S. 24°50'W.
175.0'
ST. MT.
CROSS ROAD
410.0'
146+00
ST. MT.
N. 44°11'E.
720.0
TOWN LINE
N. 66°04'W.
153+29
Westfield
Southwick.
MORTON J. FOWLER.

Also one certain tract of land situated in Southwick, in said County supposed to belong to heirs of ENOCH SACKETT, and described as follows:

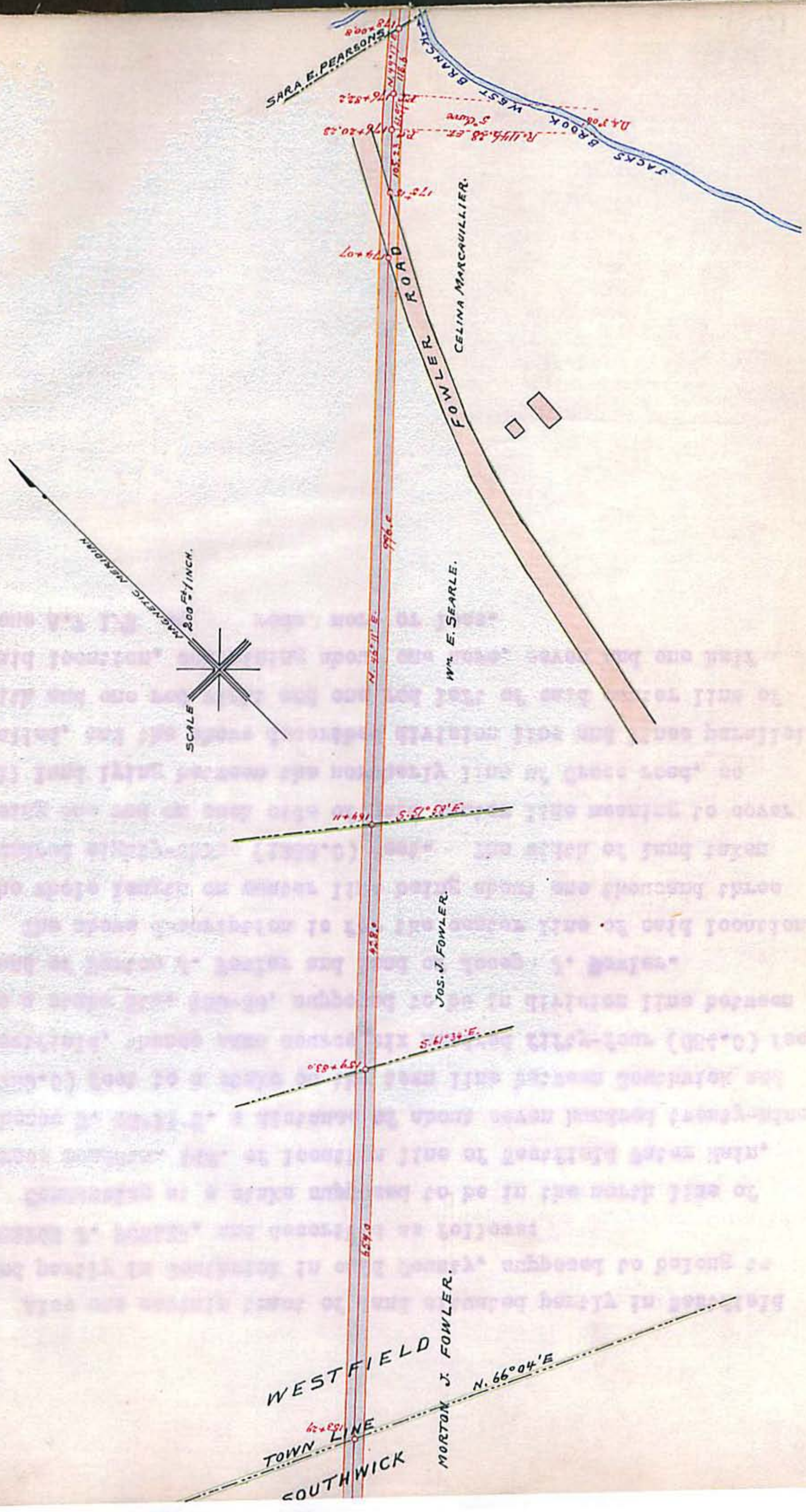
Commencing at a stake supposed to be in the division line between land of George B. Loomis and land of said Sackett, Sta.131 +06 on location line of Westfield Water Main, and running N. 65° 11'E. a distance of about eight hundred forty-six and one tenth (846.1) feet, to a stake Sta. 139+52.1 a point in the division line between land of said Sackett and land taken by Town of Westfield for Distributing Reservoir purposes.

The above description is for the center line of said location, the whole length on center line being about eight hundred forty-six and one tenth (846.1) feet. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said center line of location, containing about one hundred two and five tenths (102.5) square rods more or less.

Also one certain tract of land situated partly in Westfield and partly in Southwick in said County, supposed to belong to MORTON J. FOWLER, and described as follows:

Commencing at a stake supposed to be in the north line of Cross roadSta. 146. of location line of Westfield Water Main, thence N. 46°11'E. a distance of about seven hundred twenty-nine (729.0) feet to a stake on the town line between Southwick and Westfield, thence same course six hundred fifty-four (654.0) feet to a stake Sta. 159+83, supposed to be in division line between land of Morton J. Fowler and land of Joseph J. Fowler.

The above description is for the center line of said location, the whole length on center line being about one thousand three hundred eighty-three (1383.0) feet. The width of land taken being one rod on each side of said center line meaning to cover all land lying between the northerly line of Cross road, so called, and the above described division line and lines parallel with and one rod right and one rod left of said center line of said location, containing about one acre, seven and one half square rods (one A.7 1/2 sq. rods) more or less.


SARA E. PEARSONS
WEST BRANCH
JACKS BROOK
5° Curve
R. 1146.28 Ft.
N. 49°17' E.
116.5
105.21
CELINA MARCAUILLIER.
FOWLER ROAD
MAGNETIC MERIDIAN
SCALE 200 Ft = 1 INCH.
N. 45°11' E.
976.0
Wm E. SEARLE.
11+491
S. 51°52' E.
428.0
JOS. J. FOWLER.
S. 61°34' E.
159+83.0
659.0
WESTFIELD
MORTON J. FOWLER.
N. 66°04' E
TOWN LINE
153+29
SOUTHWICK

Also one certain tract of land situated in Westfield in said County supposed to belong to JOSEPH J. FOWLER, and described as follows:

Commencing at a stake in the supposed division line between land of Morton J. Fowler and land of Joseph J. Fowler, Sta. 159+83 of locationline of Westfield Water Main thence N. 46° 11'E. a distance of about four hundred twenty-eight (428.0) feet to Sta. 164+11 a point supposed to be in division line between land of Joseph J. Fowler and land of William E. Searle.

The above description is for the center line of location, the whole length on center line being about four hundred twenty-eight (428.0) feet. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division lines, and lines parallel with and one rod right and one rod left of said center line of said location, containing about fifty-one and eight tenths (51.8) square rods more or less.

Also one certain tract of land situated in Westfield supposed to belong to WILLIAM E. SEARLE, and described as follows:

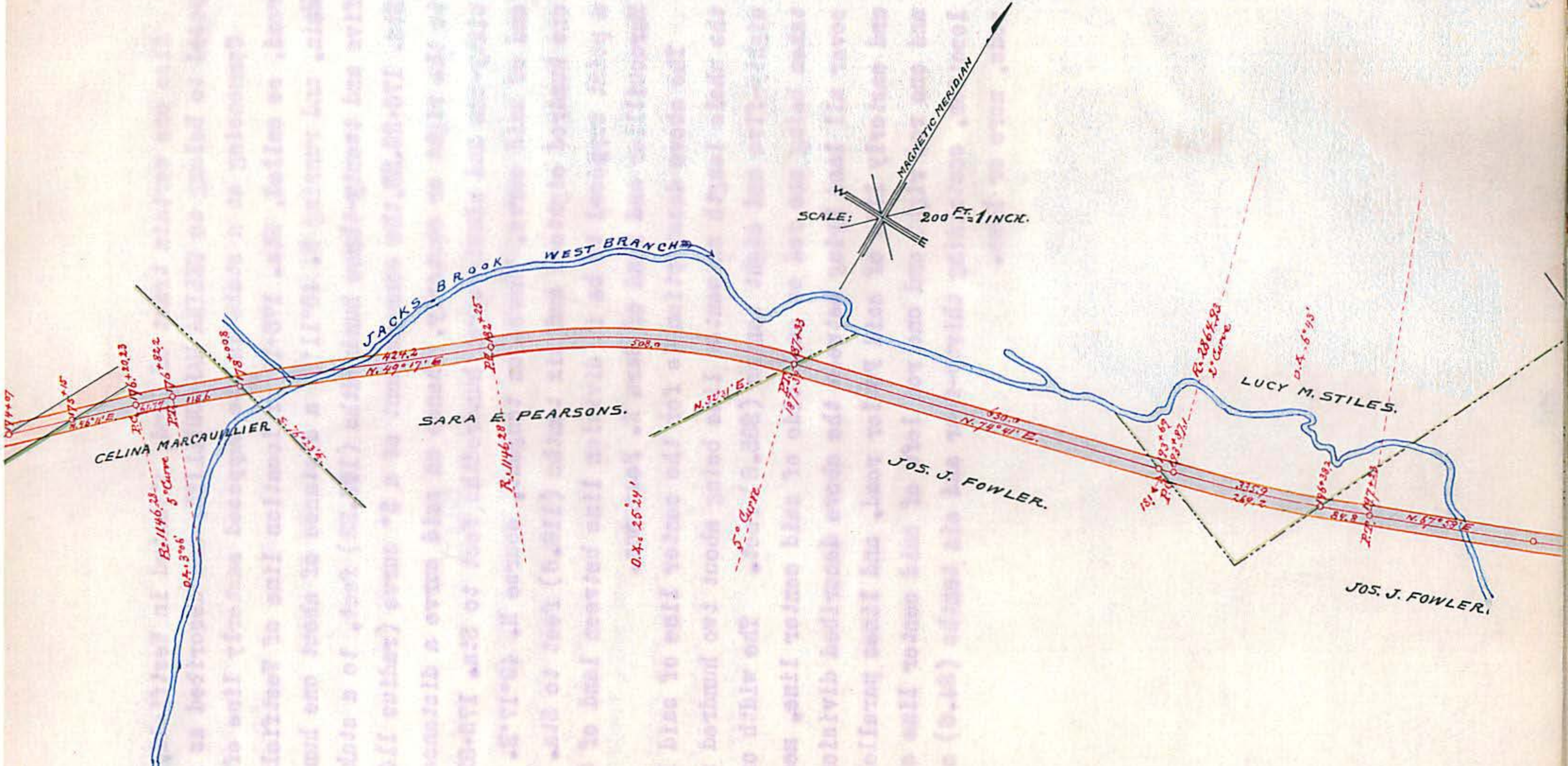
Commencing at a stake in the division line between land of Joseph J. Fowler and land of William E. Searle Sta. 164+11 of location line of Westfield Water Main and running N.40°11'E. a distance of about nine hundred ninety-six (996.0) feet to Sta. 174+07 a point supposed to be in westerly line of Fowler road, so called.

The above description is for the center line of said location, the whole length on center line being about nine hundred and ninety-six (996.0) feet. The width of land taken being one rod on each side of said center line meaning to cover all land lying between the above described division line and said westerly line of Fowler road and lines parallel with and one rod right and one rod left of said center line of said location, containing one hundred twenty and seven tenths (120.7) square rods more or less.

Also one certain tract of land, situated in Westfield, supposed to belong to CELINA MARCOUILLIER, and described as follows:

Commencing at a stake in the supposed easterly line of Fowler road, so called, Sta. 175+15 of location line of Westfield Water Main, and running N. 46°11'E. a distance of about one hundred five and twenty-three hundredths (105.23) feet, to a stake at Sta. 176+20.23, the commencement of a 5° curve (radius 1146.3 ft.) to the right or easterly, thence on said curve a distance of about sixty-one and ninety-seven hundredths (61.97) feet to Sta. 176+82.2, the end of said curve, thence on tangent, course N. 49°17'E. about one hundred eighteen and six tenths (118.6) feet to Sta. 178+00.8 a point supposed to be in division line between land of Celina Marcouillier and land of Sara E. Pearsons.

The above description is for the center line of said location, the whole length on center line being about two hundred and eighty-five and eight tenths feet (285.8) ~~feet.~~ The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division line and easterly line of said Fowler road, and lines parallel with and one rod right and one rod left of said center line of said location, containing thirty-four and six tenths (34.6) square rods, more or less.


MAGNETIC MERIDIAN
W
E
SCALE: 200 FT. = 1 INCH.
JACKS BROOK WEST BRANCH
CELINA MARCAUILLIER
SARA E. PEARSONS.
JOS. J. FOWLER.
LUCY M. STILES.
JOS. J. FOWLER.
N. 56°11' E.
N. 49°17' E.
424.2
118.6
61.74
P.C. 176+20.23
P.T. 176+82.2
178+00.8
174+07
175+15
R. = 1146.28
5° Curve
D.A. = 3°06'
S. 7°23' E.
P.C. 182+25
R. 1146.28
508.0
D.A. = 25°24'
5° Curve
P.T. 187+33
N. 32°31' E.
530.0
N. 74°41' E.
P.C. 193+87.1
181+93+69
R. = 2864.93
2° Curve
D.A. = 6°43'
335.9
269.2
196+38.3
P.T. 197+23
84.8
N. 67°58' E.

Also one certain tract of land situated in Westfield in said County, supposed to belong to MRS. SARAH E. PEARSONS, and described as follows:

Commencing at a stake, supposed to be in the division line, between land of Celina Marcoullier and land of Mrs. Sarah E. Pearsons, Sta. 178+00.8 on location line of Westfield Water Main, and running N.49°17'E. a distance of about four hundred twenty-four and two tenths (424.2) feet, to a stake Sta. 182+25, the commencement of a 5° curve (radius 1146.3) feet to the right or easterly thence on said curve a distance of about five hundred eight (508.0) feet to Sta. 187+33 the end of said curve, thence on tangent course N.74°41'E. about six (6.0) feet to Sta. 187+39 a point supposed to be in the division line between land of Mrs. Sarah E. Pearsons and land of Joseph J. Fowler.

The above description is for the center line of location, the whole length on center being about nine hundred thirty-two and two tenths (932.2) feet. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said center line of location, containing about one hundred thirteen and seven tenths (113,7) square rods more or less.

Also one certain tract of land situated in Westfield in said County supposed to belong to JOSEPH J. FOWLER, and described as follows:

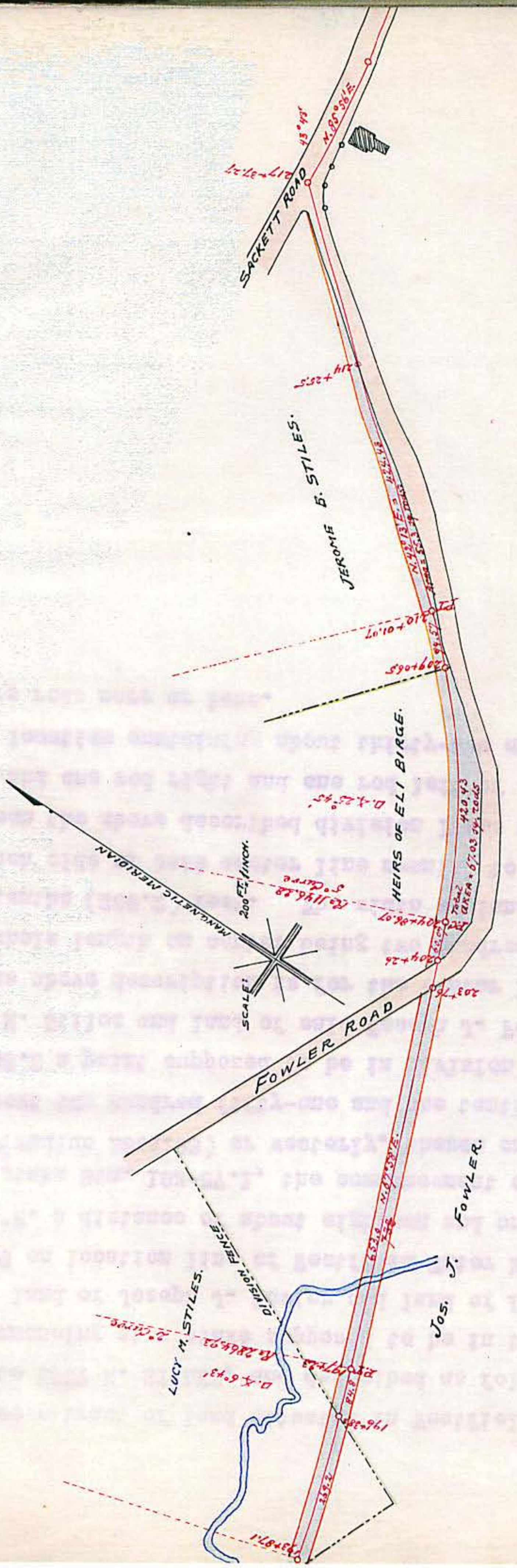
Commencing at a stake, supposed to be in the division line between land of Mrs. Sara E. Pearsons and land of Joseph J. Fowler Sta. 187+39 of location line of Westfield Water Main, thence N. 74°41'E. a distance of about six hundred thirty (630.0) feet to Sta. 193+69 a point supposed to be in division line between land of Joseph J. Fowler and land of Lucy M. Stiles.

The above description is for the center line of said location, the whole length on center line being about six hundred and thirty (630) feet. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said center line of said location, containing about seventy six and three tenths (76.3) square rods more or less.

Also one tract of land situated in Westfield, supposed to belong to LUCY M. STILES, and described as follows:

Commencing at a stake supposed to be in the division line between land of Joseph J. Fowler and land of Lucy M. Stiles, Sta. 193+69 on location line of Westfield Water Main, and running N. 74°41'E. a distance of about eighteen and one tenth (18.1) feet to a stake Sta. 193+87.1, the commencement of a 2° curve to the left (radius 2864.93) or westerly, thence on said curve a distance of about two hundred fifty-one and one tenth (251.1) feet to Sta. 196+38.2 a point supposed to be in division line between land of Lucy M. Stiles and land of said Joseph J. Fowler.

The above description is for the center line of said location the whole length on center being two hundred and sixty-nine and two tenths (269.2) feet. The width of land taken being one rod on each side of said center line meaning to cover all land lying between the above described division lines and lines parallel with and one rod right and one rod left of said center line of said location containing about thirty-two and six tenths (32.6) square rods more or less.


SACKETT ROAD
217+37.21
43°45'
N.85°56'E.
214+25.5
JEROME B. STILES.
N.42°13'E. = 424.43
Area = 55.3 sq. rods
T.C.
210+01.07
99.57
209+06.5
HEIRS OF ELI BIRGE.
D.∠25°45'
420.43
Total AREA = 67.03 sq. rods
P.C.
204+86.07
R. 1146.28
5° Curve
60.07
204+26
203+76
FOWLER ROAD
MAGNETIC MERIDIAN
SCALE: 200 FT. = 1 INCH.
JOS. J. FOWLER.
N.67°38'E.
653.6
LUCY M. STILES.
DIVISION FENCE
R. 2864.93
2° Curve
P.T.
D.∠6°43'
84.8
196+38.4
359.2
193+87.1

Also one certain tract of land situated in Westfield in said County, supposed to belong to JOSEPH J. FOWLER, and described as follows:

Commencing at a stake supposed to be in the division line between land of Lucy M. Stiles and land of Joseph J. Fowler, Sta. 196+38.2 of location line of Westfield Water Main, thence on a 2° curve (radius 2864.93ft.) to the left a distance of about eighty-four and eight tenths (84.8) feet to Sta. 197+23, thence N. 67°58'E. a distance of about six hundred fifty-three (653.0) feet to Sta. 203+76 a point supposed to be in the south line of Fowler road, so called.

The above description is for the center line of said location the whole length on center line being about seven hundred thirty-seven and eight tenths (737.8) feet. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described division line and southerly line of Fowler road and lines parallel with and one rod right and one rod left of said center line of said location, containing about eighty-nine and four tenths (89.4) square rods more or less.

Also one certain tract of land, situated in Westfield in said County, supposed to belong to the HEIRS of ELI BIRGE and described as follows:

Commencing at a stake supposed to be in the northerly line of Fowler road, so called, Sta. 204+26 of location line of Westfield Water Main and running N. 67°58'E. a distance of about sixty-and seven hundredths (60.07) feet, to a stake at Sta. 204 +86.07, the commencement of a 5° curve (radius 1146.28) to the left or westerly, thence on said curve a distance of four hundred twenty and forty-three hundredths (420.43) feet to Sta. 209 +06.5, a point supposed to be in division line between land of heirs of Eli Birge and land of Jerome B. Stiles.

The above description is for the center line of location. The land taken includes all land lying between the westerly line of Fowler road, so called, the above described division line and a line parallel to and one rod distance to the left from the above described center line of said location, containing about sixty-seven square rods more or less. (67.0) sq.rods ±

Also one certain tract of land situated in Westfield, in said County, supposed to belong to JEROME B. STILES, and described as follows:

Commencing at a stake, supposed to be in the division line between land of heirs of Eli Birge and land of Jerome B. Stiles, Sta.209+06.5 on location line of Westfield Water Main and running on a 5° curve to the left or northerly (radius 1146.28 ft.) a distance of about ninety-four and fifty-seven hundredths (94.57) feet to a stake Sta. 210+01.07. Thence on a tangent course N.42° 13'E. about four hundred twenty-four and forty-three hundredths (424.43)feet to Sta.214+25.5 a point supposed to be in the western line of Fowler Road, so called.

The above description is for the center line of location, the whole length on center being about Five hundred nineteen (519.0) feet. The land taken includes all land lying between the above described division line, the westerly line of Fowler Road, and a line parallel to and one rod distance to the left from the above described center line of said location, containing about fifty-five and three tenths (55.3) square rods more or less.

Said Town of Westfield, by its Board of Water Commissioners, James H. Bryan, Frank S. Dewey Jr. and Charles A, Firth, for the purposes aforesaid, has taken and shall forever have the right to enter upon the tracts or parcels of land above described for the purpose of laying, maintaining, replacing and repairing water-mains and examining the condition thereof.

In witness whereof, we, the said James H. Bryan, Frank S. Dewey Jr. and Charles A, Firth, have hereunto set our hands this first day of April in the year of our Lord One Thousand Eight hundred and Ninety-eight.

(Signed) Ja. H. Bryan
Frank S. Dewey Jr
Charles A Firth

In presence of
Chas H. Oakes

DESCRIPTION OF LAND
taken for
DISTRIBUTING RESERVOIR.

Know all men that the Town of Westfield, in the County of Hampden and Commonwealth of Massachusetts, in the exercise of powers conferred by Chapter three hundred and forty-two of the Acts of the year Eighteen Hindred and Ninety-five, being an Act entitled, "An Act to authorize the Town of Westfield to increase its Water Supply," and approved April 30th.1895, has by its Board of Water Commissioners, for the purpose of supplying the inhabitants of said Town with pure water, for the extinguishment of fires and for domestic and other purposes, taken all the rights to the following described parcel of land the same to be used for the purposes of construction and use of a distributing reservoir.

A certain tract of land situated in Southwick in said County, and supposed to belong to ~~heirs~~ the devisees or estate of ENOCH SACKETT deceased, and described as follows:

Commencing at a Stone Mt.at the south east corner of land taken and in the Westerly line of Cross road, so called, thence running S. 24°50'W. a distance of five hundred fifty-seven (557.0) feet to a Stone Mt.thence N. 65°10'W. a distance of five hundred sixty (560.0) feet toaStone Mt., thence N. 24°50'E. a distance of five hundred eighty-four (584.0) feet to a Stone Mt. in westerly line of Cross road, thence on said westerly line of Cross road south-easterly a distance of about five hundred eighty five (585.0) feet to place of beginning, containing six acres one hundred thirty-one and two tenths (6A.131.2) square rods more or less.

The foregoing described parcel of land is supposed to belong to the devisees or estate of ENOCH SACKETT deceased and is surrounded by land of the Devisees or estate of said ENOCH SACKETT.

Said Town of Westfield by its Board of Water Commissioners James H. Bryan, Frank S. Dewey Jr. and Charles A. Firth, for the purposes aforesaid, has taken all the rights to the above described tract of land.

In witness whereof, we, the said James H. Bryan, Frank S. Dewey Jr. and Charles A. Firth have hereunto set our hands this first day of April in the year of our Lord One Thousand Eight Hundred and Ninety-eight.

(Signed)

Ja. H. Bryan
Frank S. Dewey Jr
Charles A. Firth

In presence of

Chas H. Oakes

Westfield Water Works. Granville Supply.

Description of Land.

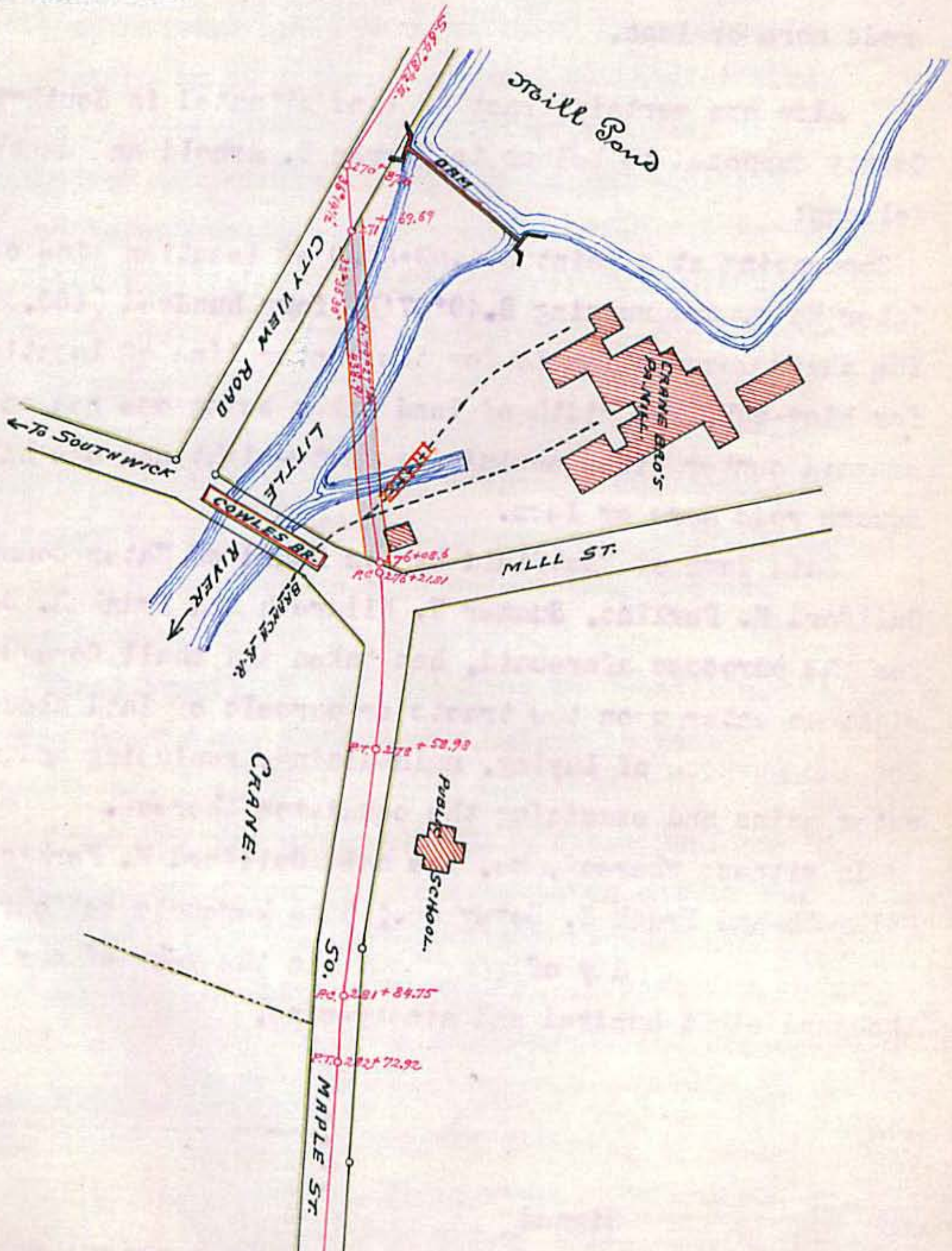
Know all Men, That the Town of Westfield, in the County of Hampden and Commonwealth of Massachusetts, in the exercise of powers conferred by Chapter three hundred and forty-two of the Acts of the Year Eighteen hundred and ninety-five, being an Act entitled "An Act to authorize the Town of Westfield to increase its Water Supply", and approved April 30th.1895, has by its Water Commissioners for the purpose of supplying the inhabitants of said Town with pure water for the extinguishment of fires and for domestic and other purposes, taken the right to lay and maintain water mains and replace the same and keep the same in repair, within certain tracts or parcels of land, situated, bounded and described as follows:

One certain tract of land, situated in Weatfield, in said County, supposed to belong to James A. Crane and Robert B. Crane and described as follows:

Commencing at a point in the northerly line of the highway leading from Cowle's Bridge, so called, to City View Boulevard at Sta.271+69.69 of location line of Westfield Water Main, thence running N.79°27'E. a distance of four hundred thirty-eight and ninety-one one-hundredths (438.91) feet to a point Sta.276+08.60 supposed to be in the westerly line of South Maple Street. The above described line is for the center line of location. The width of land taken being one rod on each side of said center line, meaning to cover all land lying between the above described highway lines and lines parallal with and one rod right and one rod left of said center line of location, containing about fifty-three and two tenths(53.2) square rods more or less.

HAMPDEN COUNTY REGISTRY OF DEEDS.
JUN 6 1899
Received 9 H. 50 M. a.m.
Attest James R. Wells Register

4508


Mill Pond
DAM
CITY VIEW ROAD
← TO SOUTHWICK
LITTLE
RIVER
COWLES BR.
BRANCH R.R.
CRANE BRO'S PA. MILL
MLLL ST.
270+87.
271+69.69
276+08.6
P.C. 276+21.81
P.T. 278+58.93
CRANE.
PUBLIC SCHOOL.
SO. MAPLE ST.
P.C. 281+84.75
P.T. 282+72.92

Also one certain tract of land situated in Southwick, in said County supposed to belong to F.D.Lambson and described as follows:

Commencing at a point Sta.46+51.73 of location line of Westfield Water Main, and running N.42°49'E. one hundred twenty (120.00) feet.

The above description is for the center line of the pipe for the air-valve. The width of land taken being one rod on each side of said center line, containing fourteen and one half (14.5) square rods more or less.

Also one certain tract of land situated in Southwick, in said County supposed to belong to Warren D. Arnold and described as follows:

Commencing at a point Sta.59+87.6 of location line of Westfield Water Main, and running S.49°47'E. four hundred (400.00) feet. The above description is for the center line of location of pipe for blow-out. The width of land taken being one rod on each side of said center line, containing forty-eight and one half (48.5) square rods more or less.

Said Town of Westfield by its Board of Water Commissioners, Guilford H. Perkins, Sumner W. Hildreth and Frank S. Dewey Jr., for the purposes aforesaid, has taken and shall forever have the right to enter upon the tracts or parcels of land above described for the purpose of laying, maintaining, replacing and repairing water mains and examining the condition thereof.

In witness whereof, we, the said Guilford H. Perkins, Sumner W Hildreth and Frank S. Dewey Jr., have hereunto set our hands this day of in the year of our Lord One thousand eight hundred and ninety-nine.

G.H. Perkins.

Signed S. W. Hildreth

In the presence of F. S. Dewey Jr

Orin E. Parks.

Westfield Water Works. Granville Supply.
Description of land taken for Intake Reservoir.

Know all Men, That the Town of Westfield, in the County of Hampden and Commonwealth of Massachusetts, in the exercise of powers conferred by Chapter three hundred and forty-two of the Acts of the Year Eighteen hundred and ninety-five being an act entitled "An Act to authorize the Town of Westfield to increase its Water Supply," and approved April 30th, 1895, has by its Board of Water Commissioners, for the purpose of supplying the inhabitants of said Town with pure water for the extinguishment of fires and for domestic and other purposes, taken all the rights to the following described parcels of land, the same to be used for the purpose of construction, use and maintenance of an intake reservoir.

Three tracts of land situated in Granville, in said County and supposed to belong to Henry Winchell and described as follows:

Tract No. I. Commencing at a stone monument at the south-east corner of the land taken and in the northerly line of the highway which passes said Winchell's house, thence running North 26°50' East a distance of three hundred ninety-five and ninety-eight one-hundredths (395.98) feet to a stone monument, thence North 4°22' West a distance of four hundred thirty-seven and fifty-eight one-hundredths (437.58) feet to a stone monument, thence North 42° West a distance of five hundred twenty-five and sixty-six one-hundredths (525.66) feet to a stone monument, thence South 73°22' West a distance of ninety-five and sixty-six one-hundredths (95.66) feet to a stone monument, thence same course about thirty (30) feet to the center of Tillotson Brook, so called, thence southerly along said Brook to the highway, thence easterly and northerly along said highway to place of beginning, containing six acres seventy-seven square rods (6A.77R.) more or less.

Tract No. 2. Commencing at a Butternut Tree at the south-west corner of land taken and in the northerly line of the highway which passes Winchell's house, thence running North 30°15' East about thirty (30) rods, thence South 59°45' East a distance of about ninety-eight (98) feet to the middle of Tillotson Brook, so called, thence Southerly along said brook to the highway thence westerly along said highway to place of beginning, containing one acre, fifteen square rods (1A.15R) more or less.

Tract No. 3. Commencing at the middle of Tillotson Brook, so called, and in the southerly line of the highway which passes Winchell's house at the north-west corner of land taken, thence running easterly along said highway a distance of about one hundred ten (110) feet, thence south 20°30' East a distance of about two hundred thirty-one (231) feet to the middle of Tillotson Brook, thence westerly and northerly along said brook to place of beginning, containing sixty-five (65) square rods, more or less.

Tract No. I is a portion of land conveyed to Henry Winchell by A. W. Kellogg and C. K. Lambson by deed dated March 22nd, 1862.

Tract No. 2 and tract No. 3 are same tracts as described in the deed of Luke Winchell to Henry Winchell, dated October 25th, 1867 and recorded in Hampden County, Mass., Registry of Deeds, Book 258, Page 597, and it is hereby intended to take all and the same land and all priviledges and appurtenances mentioned and described in said deed.

Said Town of Westfield, by its Board of Water Commissioners, Guilford H. Perkins, Sumner W. Hildreth and Frank S. Dewey, Jr., for the purposes aforesaid has taken all the rights to the above described tracts of land.

In witness whereof, we, the said Guilford H. Perkins, Sumner W. Hildreth and Frank S. Dewey, Jr, have hereunto set our hands this Eighth day of August in the year of our Lord Nineteen Hundred.

(Signed) Guilford H. Perkins.
Sumner W. Hildreth
Frank S. Dewey. Jr.

In presence of

Oren E. Parks.

5947

HAMPDEN COUNTY REGISTRY OF DEEDS.
AUG 8 1900
Received.........H.........M.........

Attest James R. Wells Register

Whereas, by chapter 342 of the Acts of the year 1895, the town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said town and its inhabitants to, from time to time, take and hold by purchase or otherwise and convey to any part of said town, among other waters, the waters of any streams, springs and water sources within the water shed of Munn's brook in Granville, and its tributaries and confluents, and all water rights connected therewith, Now Therefore, Know All Men By These Presents, That the said Town of Westfield, by virtue of and in exercise of, and in part execution of the powers conferred by said Act, hath, for the purpose of providing itself and its inhabitants with an additional supply of water taken and appropriated the waters water sources and springs of Tillotson brook and Japhet brook in said Granville; being brooks which are tributaries and confluents of said Munn's Brook; above the following points; Tillotson brook above a point where said town has erected an intake dam upon and across said Tillotson brook and constructed a reservoir for holding said waters, and Japhet brook above the point where said town has set an intake pipe in said Japhet brook. And, further, said town of Westfield hath, for the purposes aforesaid, taken and holds all the water rights connected with said Tillotson and Japhet brooks above said points of taking,

Meaning and intending hereby to take and taking the full right to divert said described waters and convey them by means of dams, aqueducts, conduits, pipes, and other suitable structures into and about said town of Westfield for the purposes aforesaid.

The said town has not now taken and does not now hold, under the provisions or by virtue of or authority of said Act any of the waters of Dickinson brook in Granville, or any of the tributaries or branches thereof except Japhet brook; or any other waters, waters of any pond or ponds, spring or springs, stream or streams, artesian or driven well or wells or filter gallery or galleries or water rights or water sources ~~connected therewith~~ within the limits of said town of Westfield than those herein expressly set forth as taken and held.

The town of Westfield now returns and will hereafter return to the Westfield River, or its tributaries, at a point or points within its town boundaries, by its sewers and drains, such of the waters above taken as may collect within or flow or run into its sewers and drains.

~~This statement and certificate is made and filed under the provisions of said Chapter 342 of the Acts of the year 1895 and Chapter of the Acts of the year 1901.~~

In Witness Whereof, and in behalf of said Town of Westfield the Water Commissioners of Said Town have hereunto set their hands this Sixth day of March 1901.

S. H. Perkins
[illegible]
F. S. Dewey. Jr

Water Commissioners of Westfield.

2191

122

Inhabitants of Wfd –

Water Supply

[illegible] COUNTY REGISTRY OF DEEDS.

MAR 28 1901

Received 12 h. 48 m. P.M.

Recorded in Book 631. Page 122

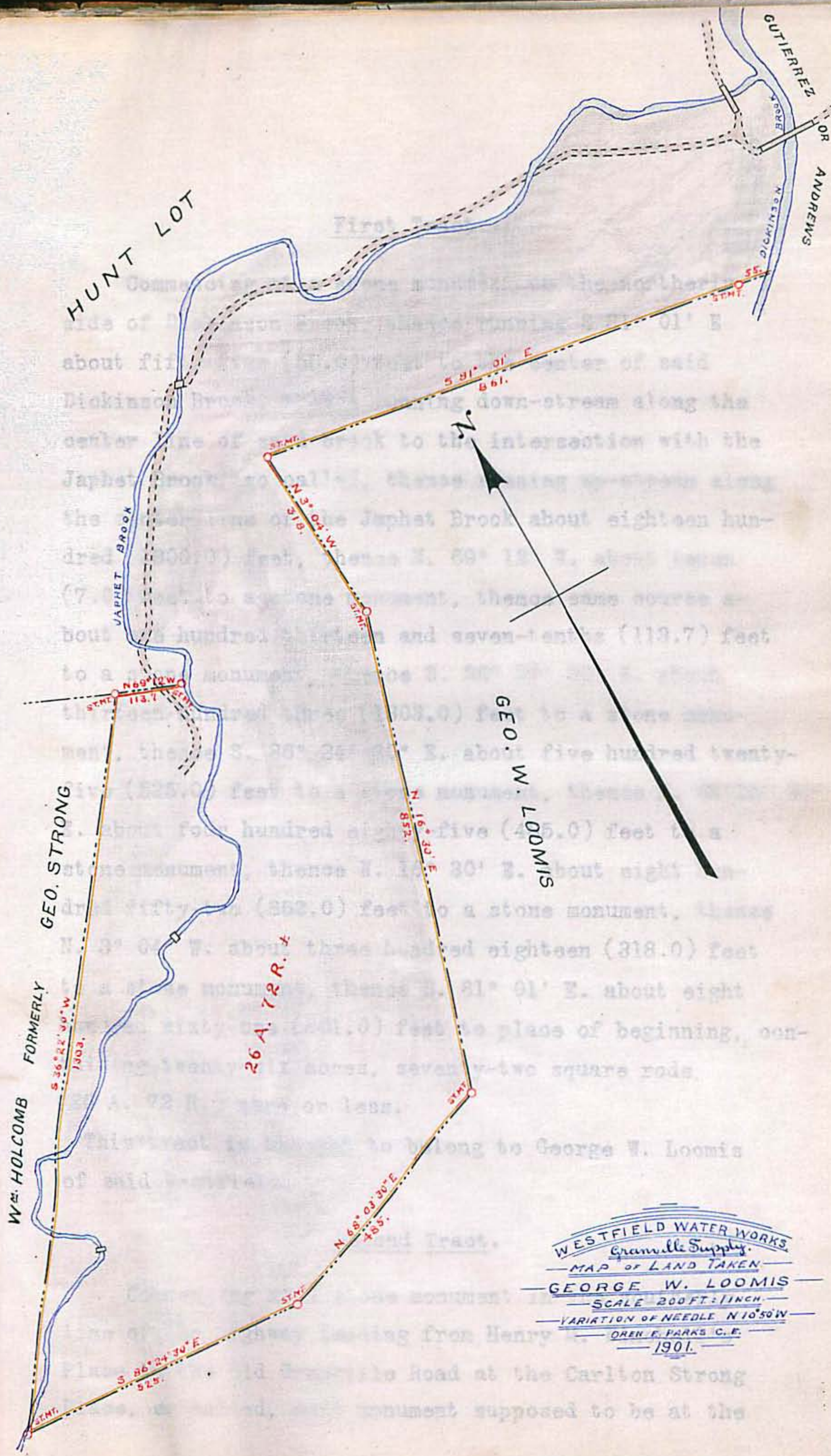
Attest.

Register.

Whereas, by chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said act, and for effectually carrying out the objects of said act:-

Now, therefore, know All Men By These Presents, that the said town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said act, for the purpose of providing said town and its inhabitants with an additional supply of water, and for holding, storing, conveying, distributing and preserving the purity of such waters and for effectually carrying out the provisions of said act, has, on this fifteenth day of August, in the year nineteen hundred and one, taken, appropriated and holds the lands and property hereinafter described, together with any and all rights of way and easements which, in any wise, thereto appertain or belong.

Said lands and property are all situated in Granville in said County of Hampden, and are described as follows:-


HUNT LOT
GUTIERREZ OR ANDREWS
DICKINSON BROOK
JAPHET BROOK
GEO. W. LOOMIS
GEO. STRONG
FORMERLY
WM. HOLCOMB
N
26 A. 72 R. ±
S. 81° 01' E
861.
55.
N. 3° 04' W
318.
N. 16° 30' E
852.
N 69° 12 W
113.7
S. 36° 22' 30" W
1303.
S. 86° 24' 30" E
525.
N. 68° 03' 30" E
485.
ST. MT.
WESTFIELD WATER WORKS
Granville Supply.
MAP OF LAND TAKEN
GEORGE W. LOOMIS
SCALE 200 FT. : 1 INCH.
VARIATION OF NEEDLE N 10° 50' W
OREN E. PARKS C. E.
1901.

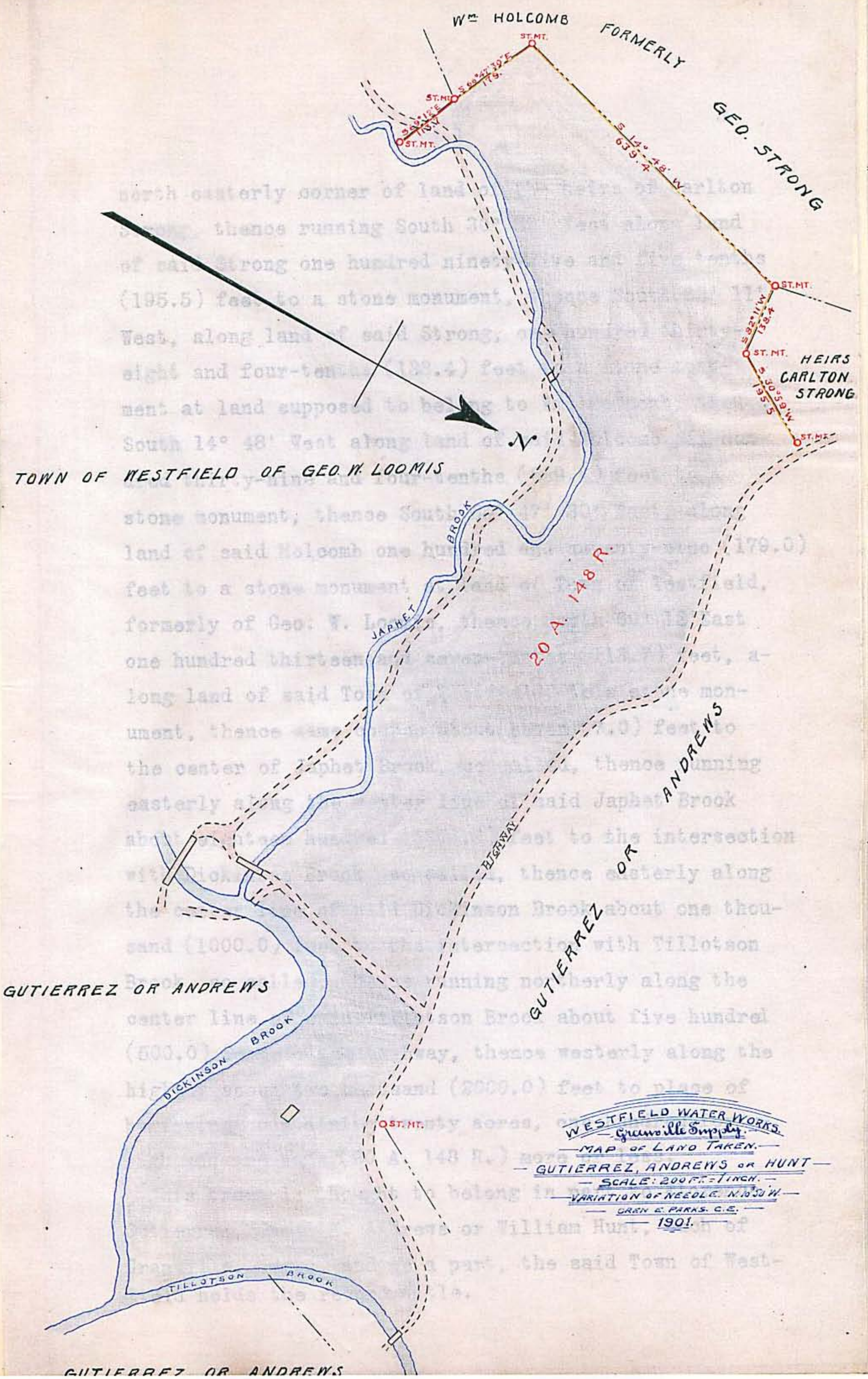
First Tract.

Commencing at a stone monument on the northerly side of Dickinson Brook, thence running S 81° 01' E about fifty-five (55.0) feet to the center of said Dickinson Brook, thence running down-stream along the center line of said brook to the intersection with the Japhet Brook, so called, thence running up-stream along the center line of the Japhet Brook about eighteen hundred (1800.0) feet, thence N. 69° 12' W. about seven (7.0) feet to a stone monument, thence same course about one hundred thirteen and seven-tenths (113.7) feet to a stone monument, thence S. 36° 22' 30" W. about thirteen hundred three (1303.0) feet to a stone monument, thence S. 86° 24' 30" E. about five hundred twenty-five (525.0) feet to a stone monument, thence N. 68°03' 30" E. about four hundred eighty-five (485.0) feet to a stone monument, thence N. 16° 30' E. about eight hundred fifty-two (852.0) feet to a stone monument, thence N. 3° 04' W. about three hundred eighteen (318.0) feet to a stone monument, thence S. 81° 01' E. about eight hundred sixty-one (861.0) feet to place of beginning, containing twenty-six acres, seventy-two square rods (26 A. 72 R.) more or less.

This tract is thought to belong to George W. Loomis of said Westfield.

Second Tract.

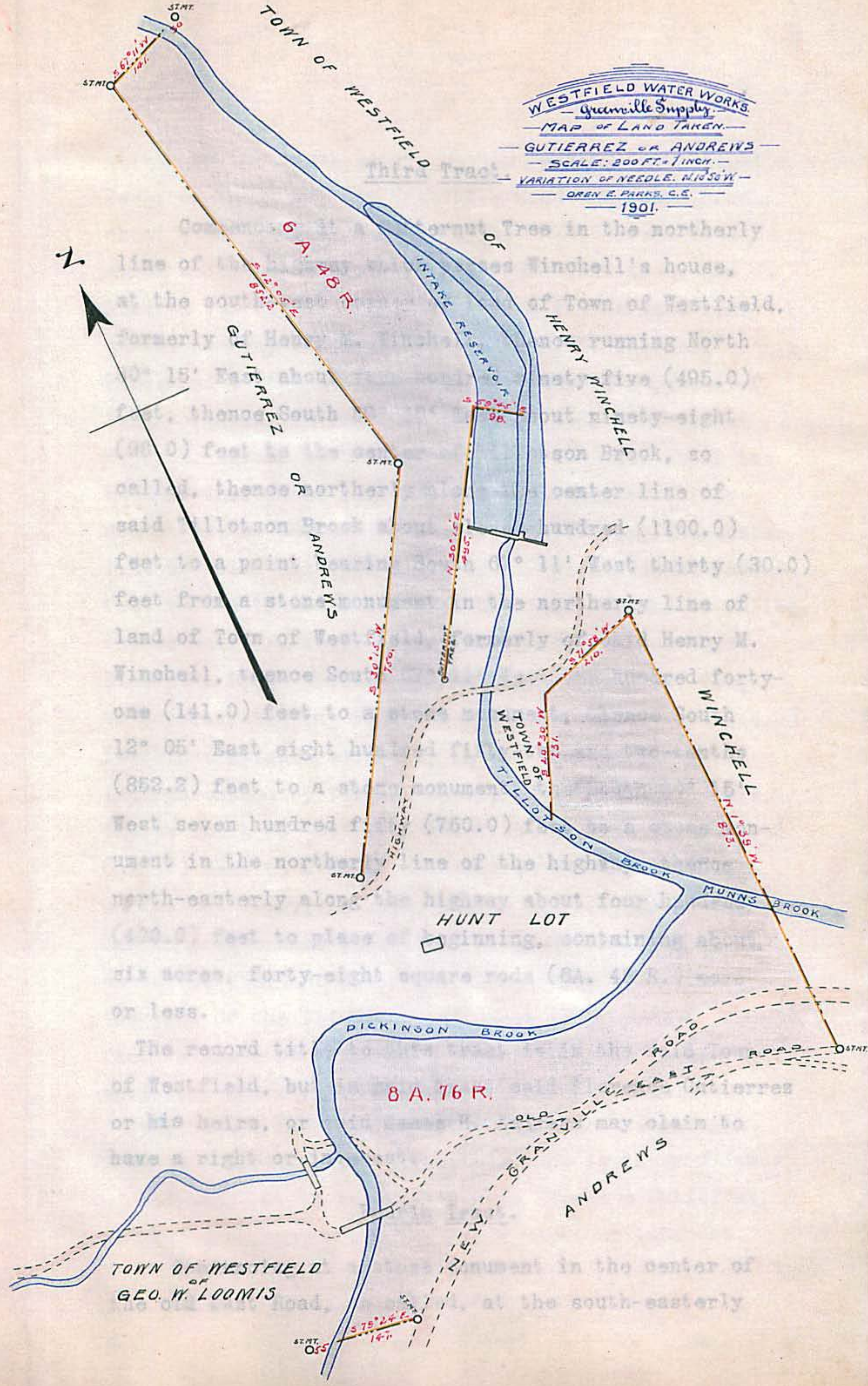
Commencing at a stone monument in the southerly line of the highway leading from Henry M. Winchell's Place to the Old Granville Road at the Carlton Strong Place, so called, said monument supposed to be at the



WESTFIELD WATER WORKS.
Granville Supply.
MAP OF LAND TAKEN.
GUTIERREZ, ANDREWS OR HUNT
SCALE: 200 FT. = 1 INCH.
VARIATION OF NEEDLE. N.10°50'W.
ORRN E. PARKS. C.E.
1901.

north easterly corner of land of the heirs of Carlton Strong, thence running South 30° 59' West along land of said Strong one hundred ninety-five and five tenths (195.5) feet to a stone monument, thence South 82° 11' West, along land of said Strong, one hundred thirty-eight and four-tenths (138.4) feet to a stone monument at land supposed to belong to Wm. Holcomb, thence South 14° 48' West along land of said Holcomb six hundred thirty-nine and four-tenths (639.4) feet to a stone monument, thence South 66° 47' 30" East, along land of said Holcomb one hundred and seventy-nine (179.0) feet to a stone monument at land of Town of Westfield, formerly of Geo. W. Loomis, thence South 69° 12'East one hundred thirteen and seven-tenths (113.7) feet, along land of said Town of Westfield, to a stone monument, thence same course about seven (7.0) feet to the center of Japhet Brook, so called, thence running easterly along the center line of said Japhet Brook about eighteen hundred (1800.0) feet to the intersection with Dickinson Brook, so called, thence easterly along the center line of said Dickinson Brook about one thousand (1000.0) feet to the intersection with Tillotson Brook, so called, thence running northerly along the center line of said Tillotson Brook about five hundred (500.0) feet to the highway, thence westerly along the highway about two thousand (2000.0) feet to place of beginning, containing twenty acres, one hundred forty-eight square rods (20 A. 148 R.) more or less.

This tract is thought to belong in part to Florence Gutierrez, James H. Andrews or William Hunt, each of Granville, Mass., and to a part, the said Town of Westfield holds the record title.


WESTFIELD WATER WORKS.
Granville Supply.
MAP OF LAND TAKEN.
GUTIERREZ OR ANDREWS
SCALE: 200 FT. = 1 INCH.
VARIATION OF NEEDLE. N. 10°50' W.
OREN E. PARKS, C.E.
1901.
N
TOWN OF WESTFIELD
ST. MT.
S 67°11' W 141.
6 A. 48 R.
S 12°05' E 852.2
GUTIERREZ OR ANDREWS
OF
INTAKE RESERVOIR
HENRY WINCHELL
S 59°45' E 98.
N 30°15' E 495.
S 30°15' W 750.
BUTTERNUT TREE
HIGHWAY
S 71°58' W 210.
N 30°07' E 231.
TOWN OF WESTFIELD
TILLOTSON BROOK
WINCHELL
N 1°39' W 873.
MUNNS BROOK
HUNT LOT
DICKINSON BROOK
8 A. 76 R.
ROAD
EAST
OLD
NEW GRANVILLE ROAD
ANDREWS
TOWN OF WESTFIELD OF GEO. W. LOOMIS
S 75°24' E 147.
55

Third Tract.

Commencing at a Butternut Tree in the northerly line of the highway which passes Winchell's house, at the south-west corner of land of Town of Westfield, formerly of Henry M. Winchell, thence running North 30° 15' East about four hundred ninety-five (495.0) feet, thence South 59° 45' East about ninety-eight (98.0) feet to the center of Tillotson Brook, so called, thence northerly along the center line of said Tillotson Brook about eleven hundred (1100.0) feet to a point bearing South 67° 11' West thirty (30.0) feet from a stone monument in the northerly line of land of Town of Westfield, formerly of said Henry M. Winchell, thence South 67° 11' West one hundred forty-one (141.0) feet to a stone monument, thence South 12° 05' East eight hundred fifty-two and two-tenths (852.2) feet to a stone monument, thence South 30° 15' West seven hundred fifty (750.0) feet to a stone monument in the northerly line of the highway, thence north-easterly along the highway about four hundred (400.0) feet to place of beginning, containing about six acres, forty-eight square rods (6A. 48 R.) more or less.

The record title to this tract is in the said Town of Westfield, but in said tract said Florence Gutierrez or his heirs, or said James H. Andrews may claim to have a right or interest.

Fourth Tract.

Commencing at a stone monument in the center of the old East Road, so called, at the south-easterly corner of the tract taken, thence running North 1° 39' West, crossing the New Granville Road and Munns Brook, about eight hundred seventy-three (873.0) feet to a stone monument, thence South 71° 58' West about two hundred ten (210.0) feet to a point in the East line of the highway which passes the Henry M. Winchell Place and at the north-easterly corner of a parcel of land belonging to the Town of Westfield, formerly of Henry M. Winchell, thence South 20° 30' West about two hundred thirty-one (231.0) feet to center of Tillotson Brook, so called, thence southerly along the center line of said Tillotson Brook about three hundred (300.0) feet to the intersection with Dickinson Brook, so called, thence south-westerly along the center line of said Dickinson Brook about fourteen hundred (1400.0) feet to a point, bearing South 79° 24' East fifty-five (55.0) feet from a stone monument, in the southerly line of land purchased by Town of Westfield of Geo. W. Loomis, thence south 79° 24' East about one hundred forty-seven (147.0) feet to a stone monument on the easterly side of the New Granville Road, thence easterly along the New Granville Road about five hundred (500.0) feet to center of Old East Road, thence easterly along the center line of the Old East Road about five hundred (500.0) feet to place of beginning, containing eight acres, seventy-six square rods (8 A. 76 R.) more or less.

The record title to part of this tract is in said Town of Westfield, and to another part is in said James H. Andrews; but in said tract said Florence Gutierrez, or his heirs, may claim to have a right or interest.

In Witness Whereof, the said Town has caused this instrument to be signed by the Water Commissioners of said Town.

Board of

Water Commissioners.

G. H. Perkins.

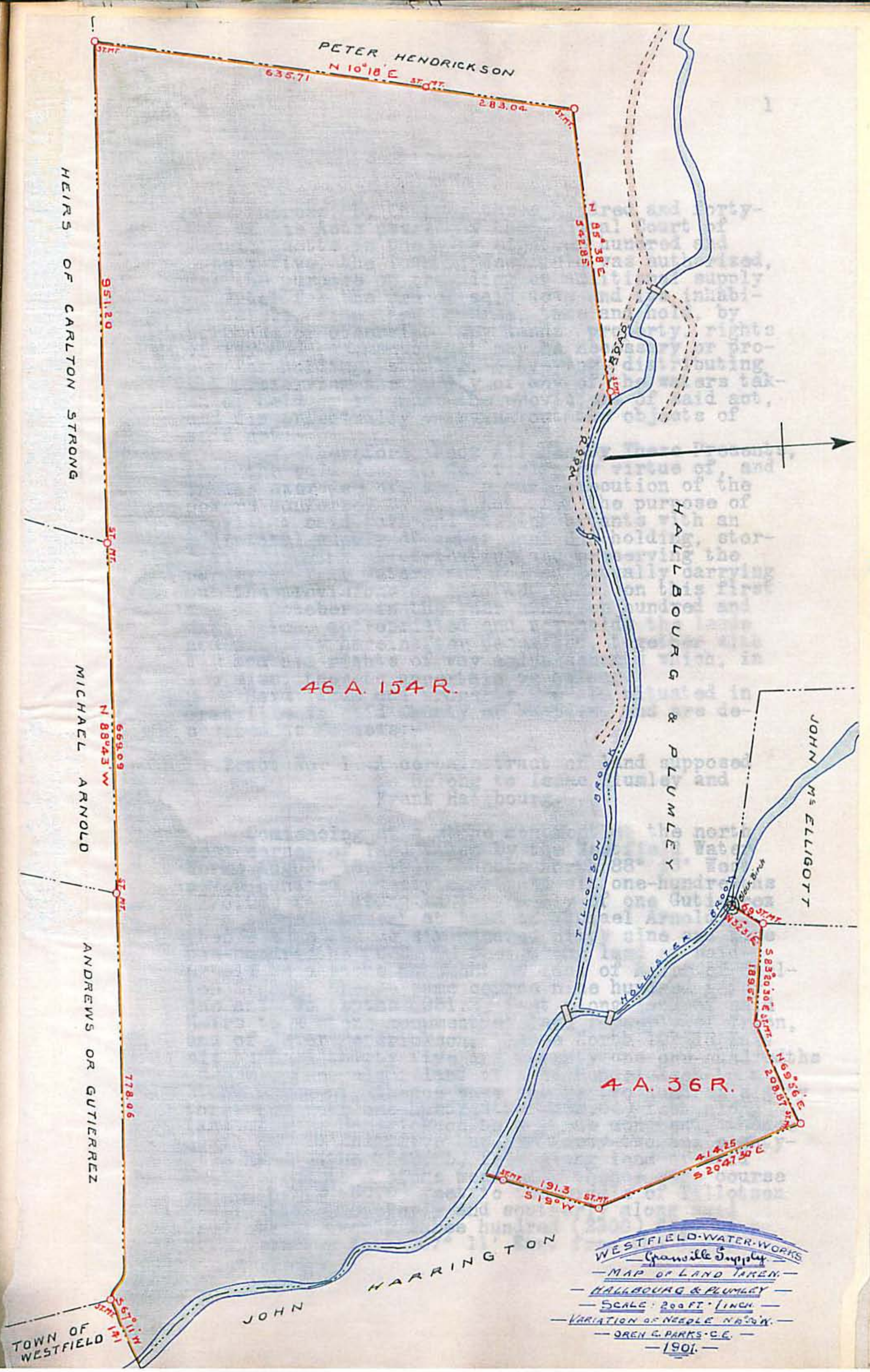
L. W. Hildreth.

F. S. Dewey, Jr

In Presence of Ann E. Parks.

HAMPDEN COUNTY REGISTRY OF DEEDS.
SEP 26 1901
Received .... H. .... M. ....

7723



WESTFIELD·WATER·WORKS
— Granville Supply —
— MAP OF LAND TAKEN. —
— HALLBOURG & PLUMLEY —
— SCALE : 200 FT. · 1 INCH —
— VARIATION OF NEEDLE N 8°50' W. —
— OREN C. PARKS · C.E. —
— 1901. —

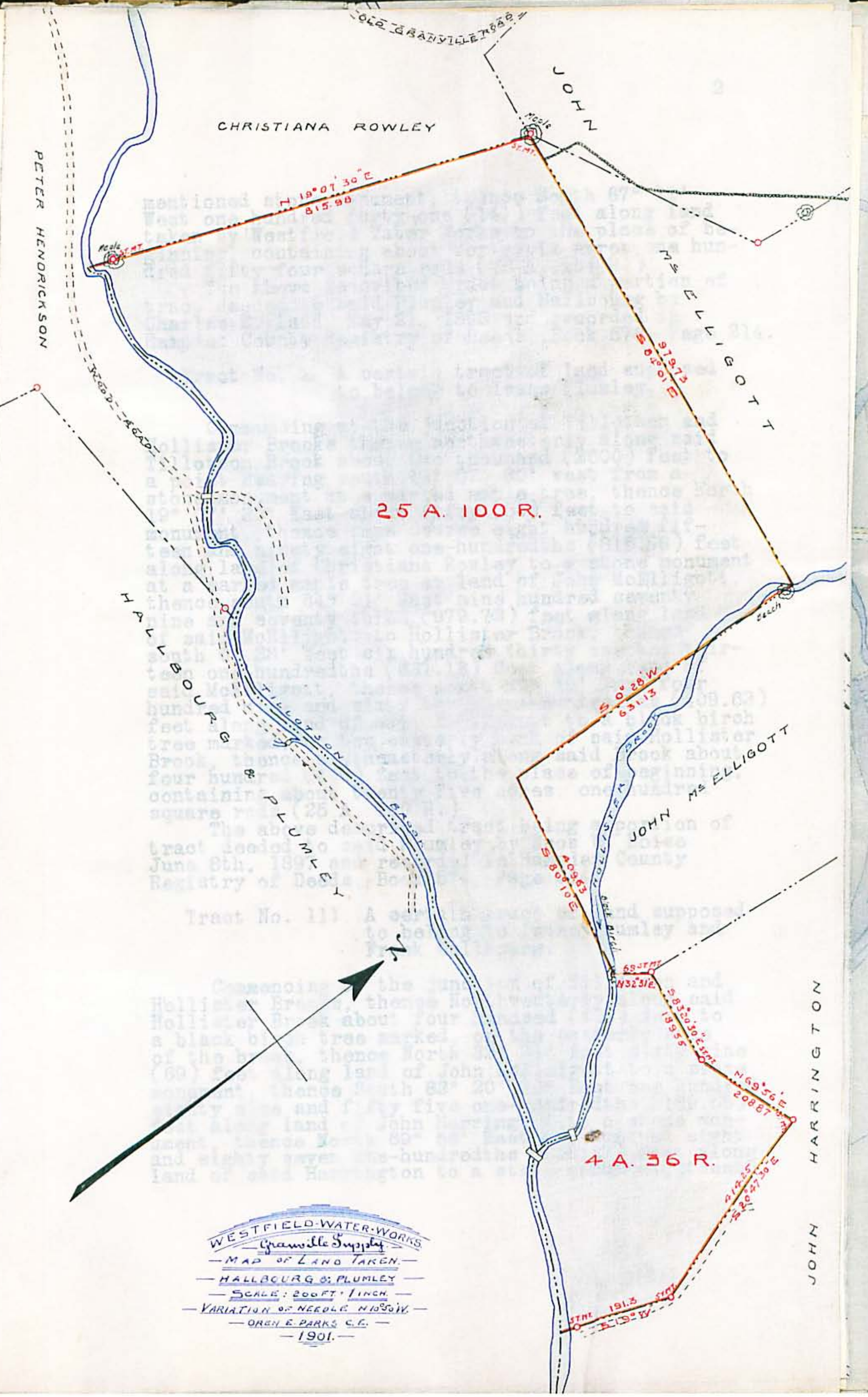
Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said act, and for effectually carrying out the objects of said act:-

Now, therefore, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of providing said town and its inhabitants with an additional supply of water, and for holding, storing, conveying, distributing and preserving the purity of such waters and for effectually carrying out the provisions of said act, has, on this first day of October, in the year nineteen hundred and one, taken, appropriated and now holds the lands and property hereinafter described, together with any and all rights of way and easements which, in any wise, thereto appertain or belong.

Said lands and property are all situated in Granville in said County of Hampden, and are described as follows:-

Tract No. 1. A certain tract of land supposed to belong to Isaac Plumley and Frank Hallbourg.

Commencing at a stone monument at the north west corner of land taken by the Westfield Water Works August 15, 1901; thence North 88° 43' West seven hundred seventy eight and six one-hundredths (778.06) feet along land formerly of one Gutierrez to a stone monument at land of Michael Arnold, thence same course six hundred sixty nine and nine one-hundredths (669.09) feet along land of said Arnold to a stone monument at land of Heirs of Carlton Strong, thence same course nine hundred fifty one and two tenths (951.2) feet along land of said Heirs to a stone monument at land formerly of Tryon, and of Peter Hendrickson, thence North 10° 18'East six hundred thirty five and seventy one one-hundredths (635.71) feet along land of said Hendrickson to a stone monument, thence same course two hundred eighty three and four one-hundredths (283.04) feet along land of said Hendrickson to a stone monument, thence North 85° 38'East five hundred forty-two and eighty-five hundredths (542.85) feet along land of said Hendrickson to a stone monument, thence same course about thirty (30.0) feet to the middle of Tillotson Brook, thence easterly and southerly along said Brook about twenty three hundred (2300) feet to a point bearing North 67° 11' East from the first



WESTFIELD-WATER-WORKS
Granville Supply
—MAP OF LAND TAKEN.—
—HALLBOURG & PLUMLEY—
—SCALE: 200 FT = 1 INCH.—
—VARIATION OF NEEDLE N 10°50'W.—
—OREN E. PARKS C.E.—
—1901.—

mentioned stone monument, thence South 67° 11' West one hundred forty-one (141) feet along land taken by Westfield Water Works to the place of beginning, containing about forty-six acres one hundred fifty four square rods (46 A. 154 R.)

The above described tract being a portion of tract deeded to said Plumley and Hallbourg by Charles E. Ladd, May 21, 1898 and recorded in Hampden County Registry of Deeds, Book 578, Page 214.

Tract No. 2. A certain tract of land supposed to belong to Isaac Plumley.

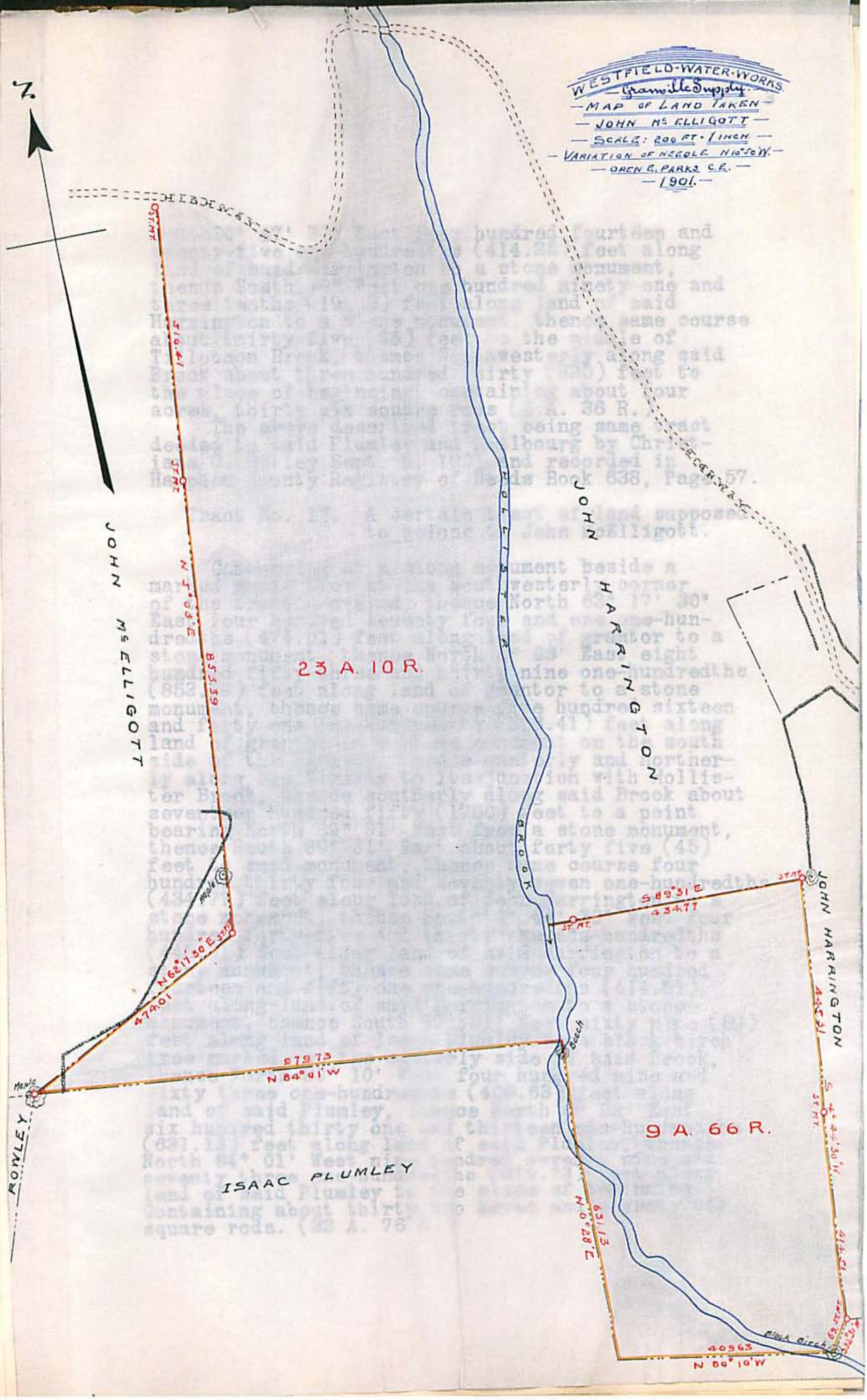
Commencing at the junction of Tillotson and Hollister Brooks thence northwesterly along said Tillotson Brook about two thousand (2000) feet to a point bearing south 19° 07' 30" west from a stone monument at a marked maple tree, thence North 19° 07' 30" East about fifty (50) feet to said monument, thence same course eight hundred fifteen and ninety eight one-hundredths (815.98) feet along land of Christiana Rowley to a stone monument at a marked maple tree at land of John McElligott, thence south 84° 01' East nine hundred seventy nine and seventy three one hundredths (979.73) feet along land of said McElligott to Hollister Brook, thence south 0° 28' West six hundred thirty one and thirteen one-hundredths (631.13) feet along land of said McElligott, thence south 80° 10' East four hundred nine and sixty three one-hundredths (409.63) feet along land of said McElligott to a black birch tree marked, on the easterly bank of said Hollister Brook, thence southeasterly along said Brook about four hundred (400) feet to the place of beginning, containing about twenty five acres, one hundred square rods (25 A. 100 R.)

The above described tract being a portion of tract deeded to said Plumley by Enos W. Boise June 8th, 1897 and recorded in Hampden County Registry of Deeds, Book 574, Page 344.

Tract No. 111. A certain tract of land supposed to belong to Isaac Plumley and Frank Hallbourg.

Commencing at the junction of Tillotson and Hollister Brooks, thence Northwesterly along said Hollister Brook about four hundred (400) feet to a black birch tree marked, on the easterly side of the brook, thence North 32° 31' East sixty nine (69) feet along land of John McElligott to a stone monument, thence South 83° 20' 30" East one hundred eighty nine and fifty five one-hundredths (189.55) feet along land of John Harrington to a stone monument, thence North 69° 56' East two hundred eight and eighty seven one-hundredths (208.87) feet along land of said Harrington to a stone monument, thence

WESTFIELD-WATER-WORKS.
—Granville Supply.
—MAP OF LAND TAKEN—
—JOHN Mc ELLIGOTT—
—SCALE: 200 FT.-1 INCH—
—VARIATION OF NEEDLE N 10°50' W.—
—OREN E. PARKS C.E.—
—1901.—



South20° 47' 30" East four hundred fourteen and twenty-five one-hundredths (414.25) feet along land of said Harrington to a stone monument, thence South 19° West one hundred ninety-one and three tenths (191.3) feet along land of said Harrington to a stone monument, thence same course about thirty five (35) feet to the middle of Tillotson Brook, thence Northwesterly along said Brook about three hundred thirty (330) feet to the place of beginning, containing about four acres, thirty six square rods (4 A. 36 R.)

The above described tract being same tract deeded to said Plumley and Hallbourg by Christiana G. Rowley Sept. 5, 1901 and recorded in Hampden County Registry of Deeds Book 638, Page 57.

Tract No. 1V. A certain tract of land supposed to belong to John McElligott.

Commencing at a stone monument beside a marked maple tree at the southwesterly corner of the tract conveyed, thence North 62° 17' 30" East four hundred seventy four and one one-hundredths (474.01) feet along land of grantor to a stone monument, thence North 5° 03' East eight hundred fifty-three and thirty nine one-hundredths (853.39) feet along land of grantor to a stone monument, thence same course five hundred sixteen and forty one one-hundredths (516.41) feet along land of grantor to a stone monument on the south side of the Highway, thence easterly and northerly along the Highway to its junction with Hollister Brook, thence southerly along said Brook about seventeen hundred fifty (1750) feet to a point bearing North 89° 31' West from a stone monument, thence South 89° 31' East about forty five (45) feet to said monument, thence same course four hundred thirty four and seventy seven one-hundredths (434.77) feet along land of John Harrington to a stone monument, thence South 4° 44' 30" West four hundred forty-five and thirty one one-hundredths (445.31) feet along land of said Harrington to a stone monument, thence same course four hundred fourteen and fifty one one-hundredths (414.51) feet along land of said Harrington to a stone monument, thence South 32° 31' West sixty nine (69) feet along land of Isaac Plumley and Frank Hallbourg to a black birch tree marked, on the easterly side of said Brook, thence North 80° 10' West four hundred nine and sixty three one-hundredths (409.63) feet along land of said Plumley, thence North 0° 28' East six hundred thirty one and thirteen one-hundredths (631.13) feet along land of said Plumley, thence North 84° 01' West nine hundred seventy nine and seventy three one-hundredths (979.73) feet along land of said Plumley to the place of beginning. Containing about thirty two acres and seventy six square rods. (32 A. 76 R.)

The above described tract being a portion of tract deeded to said McElligott by Sidney A. Clark and Mary D. Clark, April 12th, 1898 and recorded in Hampden County Registry of Deeds, Book 576, Page 55.

In Witness Whereof, the said Town has caused this instrument to be signed by the Water Commissioners of said Town.

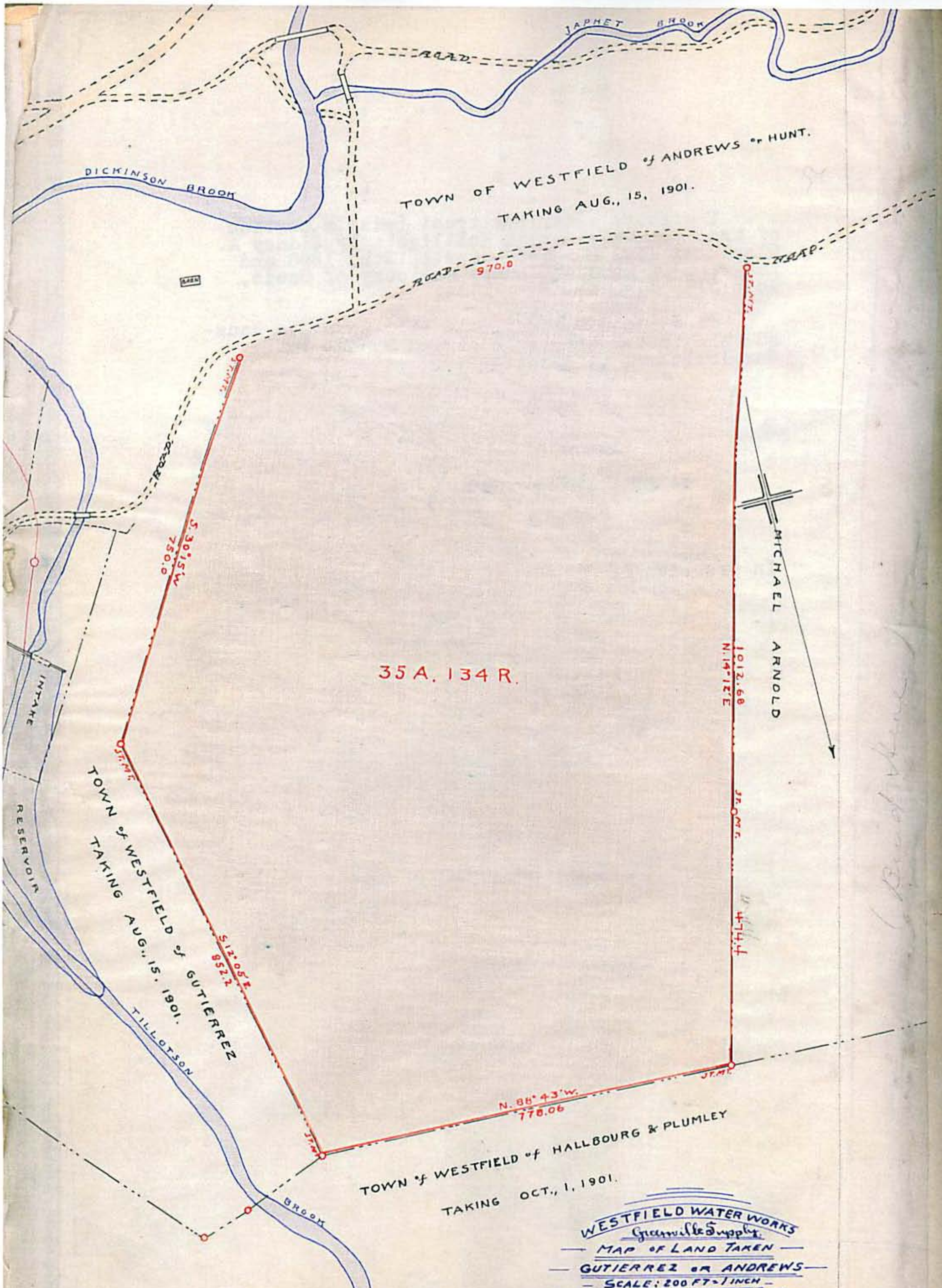
Board of
Water Commissioners.

G. H. Perkins.
S. W. Hildreth
F. S. Dewey Jr

In presence of

H. T. Snow

9969
HAMPDEN COUNTY REGISTRY OF DEEDS.
DEC 16 1901
Received 11 H. 5 M. a.m.,



WESTFIELD WATER WORKS
Granville Supply.
— MAP OF LAND TAKEN —
— GUTIERREZ OR ANDREWS —
— SCALE: 200 FT.=1 INCH —
— VARIATION OF NEEDLE N.10°50'W. —
— OREN E. PARKS, C.E. —
— 1903 —

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said act, and for effectually carrying out the objects of said act:-

Now, therefore, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said act, for the purpose of providing said town and its inhabitants with an additional supply of water, and for holding, storing, conveying, distributing and preserving the purity of such waters and for effectually carrying out the provisions of said act, has, on this tenth day of March, in the year nineteen hundred and three, taken, appropriated and now holds the lands and property hereinafter described, together with any and all rights of way and easements which, in any wise, thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

Commencing at a stone monument on the northerly side of the highway which passes Winchell's house and at the southwest corner of land taken by Town of Westfield of James H. Andrews by taking filed in Hampden County, Mass. Registry of Deeds, Sept. 26, 1901, thence westerly along said highway about nine hundred seventy (970) feet to a stone monument at the southeasterly corner of land supposed to belong to Michael Arnold, thence North 14° 12' East along land of said Arnold ten hundred twelve and sixty-eight one-hundredths (1012.68) feet to a stone monument, thence same course along land of said Arnold four hundred seventy-four and four tenths (474.4) feet to a stone monument at land taken by Town of Westfield of Hallbourg and Plumley by taking filed in Hampden County, Mass. Registry of Deeds, Dec. 16, 1901, thence South 88° 43' East along land of said Town seven hundred seventy-eight and six one-hundredths (778.06) feet to a stone monument at the northwest corner of land taken of said Andrews, thence South 12° 05' East along said land taken of Andrews eight hundred fifty-two and two tenths (852.2) feet to a stone monument, thence South 30° 15' West along said land taken of Andrews seven hundred fifty (750) feet to the place of beginning, containing about thirty-five acres one hundred thirty four square rods (35 A. 134 R.) more or less.

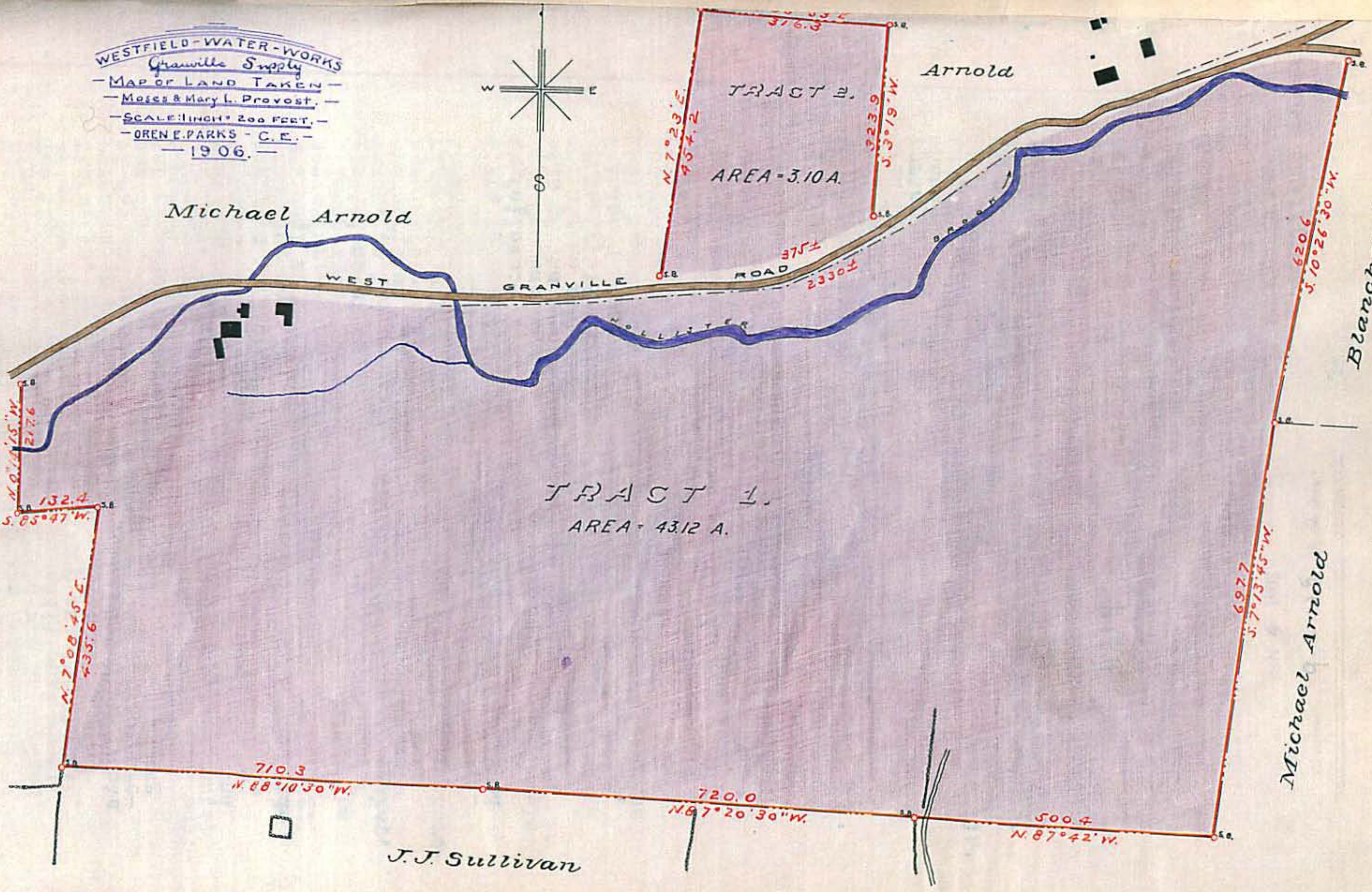
The record title to this tract is in the said Town of Westfield, but in said tract one Florence Gutierrez or his heirs, or one James H. Andrews may claim to have a right or interest.

In Witness Whereof, the said Town has caused this instrument to be signed by the Water Commissioners of said Town.

Board of Water Commissioners.
S. W. Hildreth
Frank S Dewey Jr
G. H. Perkins

In the presence of
Oren E. Parks

The words "and for effectually carrying out the objects of said act" being added before execution.
Attest. Oren E. Parks.


WESTFIELD-WATER-WORKS
Granville Supply
-MAP OF LAND TAKEN-
-Moses & Mary L. Provost.-
-SCALE: 1 INCH = 200 FEET.-
-OREN E. PARKS - C. E.-
-1906.-
W
E
S
Michael Arnold
Arnold
TRACT 2.
AREA = 3.10 A.
N. 7°23' E.
454.2
376.3
323.9
S. 3°19' W.
WEST GRANVILLE ROAD
375±
2330±
HOLLISTER
BROOK
S.B.
N. 0°18'15" W.
217.6
132.4
S. 85°47' W.
N. 7°08'45" E.
435.6
TRACT 1.
AREA = 43.12 A.
J. J. Sullivan
710.3
N. 88°10'30" W.
720.0
N. 87°20'30" W.
500.4
N. 87°42' W.
J. J. Sullivan
697.7
S. 7°13'45" W.
Michael Arnold
620.6
S. 10°26'30" W.
Blanchard

("PROVOST")

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said act, and for effectually carrying out the objects of said act:-

Now, therefore, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said act, for the purpose of providing said town and its inhabitants with an additional supply of water, and for holding, storing, conveying, distributing and preserving the purity of such waters and for effectually carrying out the provisions of said act, has, on this second day of July, in the year 1906, taken, appropriated and now holds the lands and property hereinafter described, together with any and all rights of way and easements which, in any-wise, thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

Tract #1. Commencing at a stone monument on the southerly side of the West-Granville Road about four hundred fifty feet westerly of its junction with the Wild-Cat Road and in the division line between land of Provost and land supposed to belong to one Blanchard, thence South 10° 26' 30" West along land supposed to belong to said Blanchard six hundred twenty and six tenths (620.6) feet to a stone monument at land of Michael Arnold, thence South 7° 13' 45" West along land of said Arnold six hundred ninety-seven and seven tenth. (697.7) feet to a stone monument at land supposed to belong to J. J. Sullivan, thence North 87° 42' West five hundred and four tenths (500.4) feet to a stone monument, thence North 87° 20' 30" West seven hundred twenty (720.0) feet to a stone monument, thence North 88° 10' 30" West seven hundred ten and three tenths (710.3) feet to a stone monument, thence North 7° 8' 45" East four hundred thirty-five and six tenths (435.6) feet to a stone monument, thence South 85° 47' West one hundred thirty-two and four tenths (132.4) feet to a stone monument, thence North 00° 14' 15" West two hundred seventeen and six tenths (217.6) feet to a stone monument on the southerly side of the West-Granville Road (The foregoing six courses are along land supposed to belong to J. J. Sullivan), thence north-easterly along said road about twenty-three hundred thirty (2330) feet to place of beginning, containing about 43.12 acres.

Tract #2. Commencing at a stone monument on the northerly side of the West-Granville Road, about eleven hundred feet north-easterly of the last mentioned monument in the description of tract #1, at south-westerly corner of the tract taken, thence North 7° 23' East four hundred fifty-four and two tenths (454.2) feet to a stone monument, thence South 85° 53' East three hundred sixteen and three tenths (316.3) feet to a stone monument, thence South 3° 19' West three hundred twenty-three and nine tenths (323.9) feet to a stone monument on the northerly side of the West-Granville Road, thence south-westerly along said road about three hundred seventy-five feet to the place of beginning, containing about 3.1 acres.

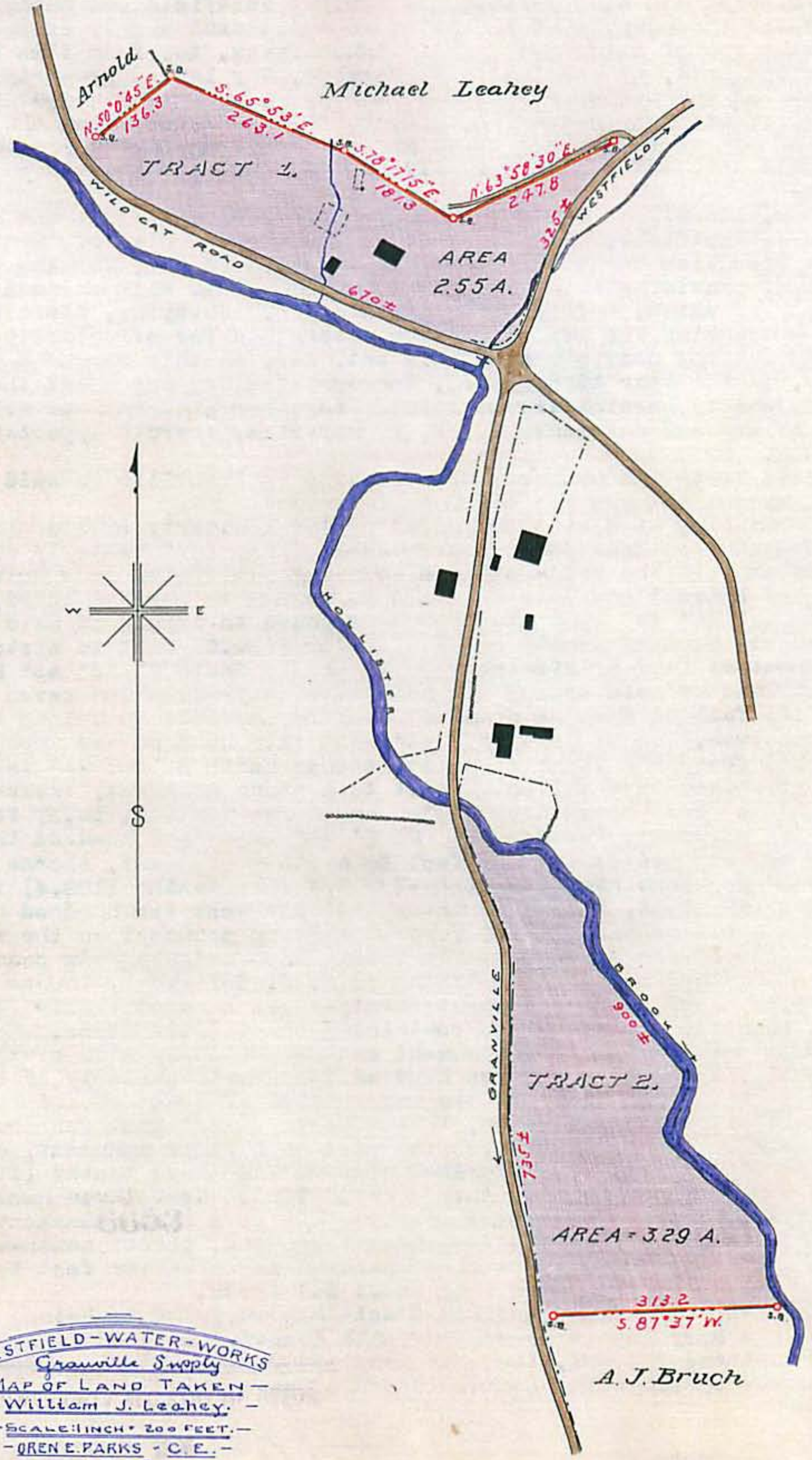
The two foregoing described tracts are supposed to belong to Moses and Mary Louise Provost of said Granville.

In Witness Whereof, the said Town has caused this instrument to be signed by the Water Commissioners of said Town.

Board of
Water Commissioners.

S. W. Hildreth
Thos Little
J H Packard

In the presence of Orrin E Parks



WESTFIELD - WATER - WORKS
Granville Supply
- MAP OF LAND TAKEN -
- William J. Leahey. -
- SCALE: 1 INCH = 200 FEET. -
- OREN E. PARKS - C. E. -
- 1906. -

3 " 62 " 6M

(Wm. J. Leahey)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said act, and for effectually carrying out the objects of said act:-

Now, therefore, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said act, for the purpose of providing said town and its inhabitants with an additional supply of water, and for holding, storing, conveying, distributing and preserving the purity of such waters and for effectually carrying out the provisions of said act, has, on this second day of July, in the year 1906, taken, appropriated and now holds the lands and property hereinafter described, together with any and all rights of way and easements which, in any wise, thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

act #1. Commencing at a stone monument on the north-easterly side of the Wild-Cat Road, so called, in the easterly line of land supposed to belong to Michael Arnold, thence North 50° 00' 45" East along land of said Arnold one hundred thirty-six and three tenths (136.3) feet to a stone monument at land supposed to belong to Michael Leahey, thence South 65° 53' East two hundred sixty-three and one tenth (263.1) feet to a stone monument, thence South 58° 17' 15" East one hundred eighty-one and three tenths (181.3) feet to a stone monument, thence North 63° 58' 30" East two hundred forty-seven and eight tenths (247.8) feet to a stone monument on the westerly side of the road from Granville to Westfield (The last three courses are along land supposed to belong to Michael Leahey), thence southerly along said road about three hundred twenty-five feet to the Wild-Cat Road, thence north-westerly along said Wild-Cat Road about six hundred seventy-feet to the place of beginning, containing about 2.55 acres.

act #2. Commencing at a stone monument on the easterly side of the road leading from Granville to Westfield and in the northerly line of land supposed to belong to A. J. Bruch, thence northerly along said road about seven hundred thirty-five feet to the middle of Hollister Brook, so called, thence south-easterly down the brook about nine hundred feet to land ~~land~~ supposed to belong to said Bruch, thence South 87° 37' West about fifteen feet to a stone monument, thence same course three hundred thirteen and two tenths (313.2) feet to the place of beginning, containing about 3.29 acres.

The two foregoing described tracts are supposed to belong to William J. Leahey of said Granville.

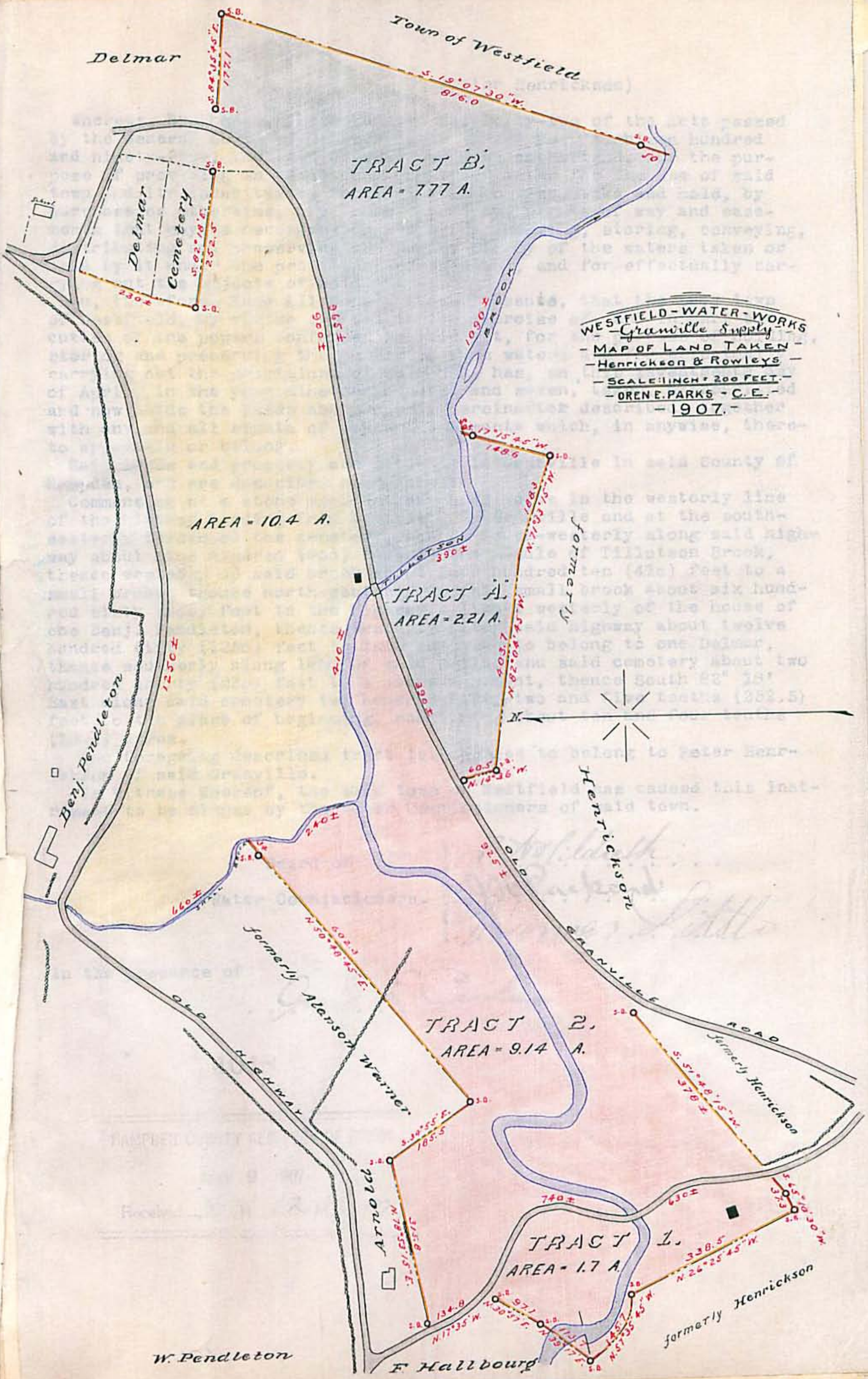
In Witness Whereof, the said Town has caused this instrument to be signed by the Water Commissioners of said Town.

Board of
Water Commissioners

S. W. Hildreth
Wm Little
J. H. Packard

In the presence of

Oren E. Parks


WESTFIELD-WATER-WORKS
Granville Supply
MAP OF LAND TAKEN
Henrickson & Rowleys
SCALE: 1 INCH = 200 FEET.
OREN E. PARKS - C.E.
1907.
Delmar
Town of Westfield
S.84°35'45"E.
177.1
S.19°07'30"W.
816.0
TRACT B.
AREA = 7.77 A.
Delmar
Cemetery
S.22°18'E.
252.5
230±
School
900±
AREA = 10.4 A.
1090±
BROOK
S.17°15'45"W.
148.6
N.71°33'15"W.
188.3
formerly
TILLOTSON
390±
TRACT A.
AREA = 2.21 A.
N.82°08'45"W.
403.7
60.5
N.18°36'W.
Henrickson
1250±
Benj. Pendleton
210±
300±
240±
460±
925±
OLD
GRANVILLE
ROAD
N.50°48'45"E.
602.3
formerly Alanson Warner
TRACT 2.
AREA = 9.14 A.
S.30°55'E.
185.5
S.51°48'15"W.
378±
formerly Henrickson
Arnold
315.6
740±
630±
S.65°10'30"W.
37.3
TRACT 1.
AREA = 1.7 A.
338.5
N.26°25'45"W.
134.8
N.17°35'W.
97.1
N.30°17'E.
N.39°17'E.
145.7
N.57°35'45"W.
formerly Henrickson
OLD HIGHWAY
W. Pendleton
F. Hallbourg
N.
S.B.

(Peter Henrickson)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefore, Know All Men By These Presents, that the said town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said act, has, on this seventeenth day of April, in the year nineteen hundred and seven, taken, appropriated and now holds the lands and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

Commencing at a stone monument supposed to be in the westerly line of the highway leading from Westfield to Granville and at the southeasterly corner of the cemetery, thence south-westerly along said highway about nine hundred (9oo) feet to the middle of Tillotson Brook, thence westerly up said brook about four hundred ten (41o) feet to a small brook, thence north-westerly up said small brook about six hundred sixty (66o) feet to the highway a little westerly of the house of one Benj. Pendleton, thence easterly along said highway about twelve hundred fifty (125o) feet to land supposed to belong to one Delmar, thence southerly along land of said Delmar and said cemetery about two hundred thirty (23o) feet to a stone monument, thence South 82° 18' East along said cemetery two hundred fifty-two and five tenths (252.5) feet to the place of beginning, containing about ten and four tenths (1o.4) acres.

The foregoing described tract is supposed to belong to Peter Henrickson of said Granville.

In Witness Whereof, the said town of Westfield has caused this instrument to be signed by the Water Commissioners of said town.

Board of Water Commissioners.
L. W. Hildreth
J. H. Packard
Thomas Little

In the presence of
Geo. E. Parks

✓ 4048

HAMPDEN COUNTY REGISTRY OF DEEDS.
MAY 9 1907
Received 4 H. 12 M. P. M.

(Fred E. Rowley)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefore, Know All Men By These Presents, that the said town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said act, has, on this seventh day of May, in the year nineteen hundred and seven, taken, appropriated and now holds the lands and property hereinafter described, to gether with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

Tract #1. Beginning at a stone monument supposed to be in the westerly line of the highway leading from the Old Granville Road to the old highway passing the house of Wilbur E. Pendleton at land formerly of one Henrickson, thence South 65° 1o' 3o" West thirty-seven and three tenths (37.3) feet to a stone monument, thence North 26° 25' 45" West three hundred thirty-eight and five tenths (338.5) feet to a stone monument about one rod southerly of Tillotson Brook, thence northwesterly parallel with said brook and one rod distant therefrom to a stone monument bearing North 57°35' 45" West about one hundred forty-five and seven tenths (145.7) feet from the last mentioned bound, thence North 39°17' East crossing said brook about one hundred thirteen and seven tenths (113.7) feet to a stone monument, the last four courses and south of the brook are along land formerly of Henrickson, thence North 3o° 57' East ninety-seven and one tenth (97.1) feet to a stone monument supposed to be in the westerly line of the highway, the last course and to the brook is along land supposed to belong to Frank Hall bourg, thence southerly along the highway about six hundred thirty (63o) feet to the place of beginning, containing about one and seven tenths (1.7) acres.

Tract #2. Beginning at a stone monument supposed to be in the easterly line of the highway bearing North 17° 35' West about one hundred thirty-four and eight tenths (134.8) feet from the northerly monument mentioned in the description of tract #1, thence North 78°53' 15" East about three hundred fifteen and eight tenths (315.8) feet to a stone monument, thence South 34° 55' East about one hundred eighty-five and five tenths (185.5) feet to a stone monument, thence North 5o°48' 45" East about six hundred two and three tenths (6o2.3) feet to a stone monument, thence same course about thirty-four feet to the middle of a small brook, the last three courses are along land of one Arnold, formerly of Alanson Warner, thence southerly down the brook to its junction with the Tillotson Brook, thence easterly down said Tillotson Brook to the Old Granville Road, thence south-westerly along said road about nine hundred twenty-five (925) feet to a stone monument at land formerly of one Henrickson, thence South 51° 48' 15" West along land formerly of said Henrickson about three hundred seventy-eight (378) feet to the highway, thence north-westerly along said highway about seven hundred forty (74o) feet to the place of beginning, containing about nine and fourteen one-hundredths (9.14) acres.

The two foregoing described tracts are supposed to belong to Fred E.

Rowley of said Granville.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of
Water Commissioners

S. N. Hildreth
J B Packard
Thomas Little

In the presence of

Oren E. Parks

4049

HAMPDEN COUNTY REGISTRY OF DEEDS.
MAY 9 1907
Received 4 H. 12 M. P.M.

(Christiana Rowley)

reas, by Chapter three hundred and forty-two of the Acts passed
he General Court of Massachusetts in the year eighteen hundred
ninety-five, the town of Westfield was authorized, for the pur-
of providing an additional supply of water for the use of said
and its inhabitants, to, from time to time, take and hold, by
hase or otherwise, any lands, property, rights of way and ease-
s that may be necessary or proper for holding, storing, conveying,
ributing and preserving the purity of any of the waters taken or
by it under the provisions of said Act, and for effectually car-
g out the objects of said Act:-
, therefore, Know All Men By These Presents, that the said town
estfield, by virtue of, and in the exercise of, and in part exe-
on of the powers conferred by said act, for the purpose of holding,
ing and preserving the purity of such waters and for effectually
ying out the provisions of said act, has, on this seventh day of
in the year nineteen hundred and seven, taken, appropriated and
holds the lands and property hereinafter described, together with
and all rights of way and easements which, in anywise, thereto
rtain or belong.
id lands and property are situated in Granville in said County of
len, and are described as follows:-
t"A". Beginning at a stone monument supposed to be in the easterly
of the Old Granville Road, thence north-easterly along said road
three hundred ninety (39o) feet to the middle of Tillotson Brook,
e easterly down said brook about three hundred ninety (39o) feet
nd formerly of Peter Henrickson, thence South 17° 15' 45" West
twenty (2o) feet to a stone monument, thence same course about
undred forty-eight and six tenths (148.6) feet to a stone monu-
thence North 71° 33' 15" West about one hundred eighty-eight and
tenths (188.3) feet, thence North 82° o4' 45" West about four hundred
and seven tenths (4o3.7) feet to a stone monument, thence North
6' West about sixty and five tenths (6o.5) feet to the place of
ning, containing about two and twenty-one one-hundredths (2.21)
. The last four courses are along land formerly of Peter Henrick-
A right of way over the road passing through this tract to land
rly owned by Henrickson is hereby reserved to the present owner.
t "B". Beginning at a point in the easterly line of the Old Gran-
Road at the Middle of Tillotson Brook, thence north-easterly
said road about nine hundred sixty-five (965) feet to a stone
ent at land of one Delmar, thence South 84° 35' 45" East along
of said Delmar about one hundred seventyseven and one tenth (177.1)
to a stone monument at land of the town of Westfield formerly of
Plumley, thence South 19° o7' 3o" West along said land about
hundred sixteen (816.o) feet to a stone monument, thence same
about fifty (5o.) feet to the middle of Tillotson Brook, thence
rly up the brook about ten hundred ninety (1o9o) feet to the place
inning, containing about seven and seventy-seven one-hundredths
acres.
two foregoing described tracts are supposed to belong to
tiana Rowley of said Granville.
Witness Whereof, the said Town of Westfield has caused this
ment to be signed by the Water Commissioners of said Town.

Board of (L. W. Hildreth
(J. W. Packard
Water Commissioners. (Thomas Little

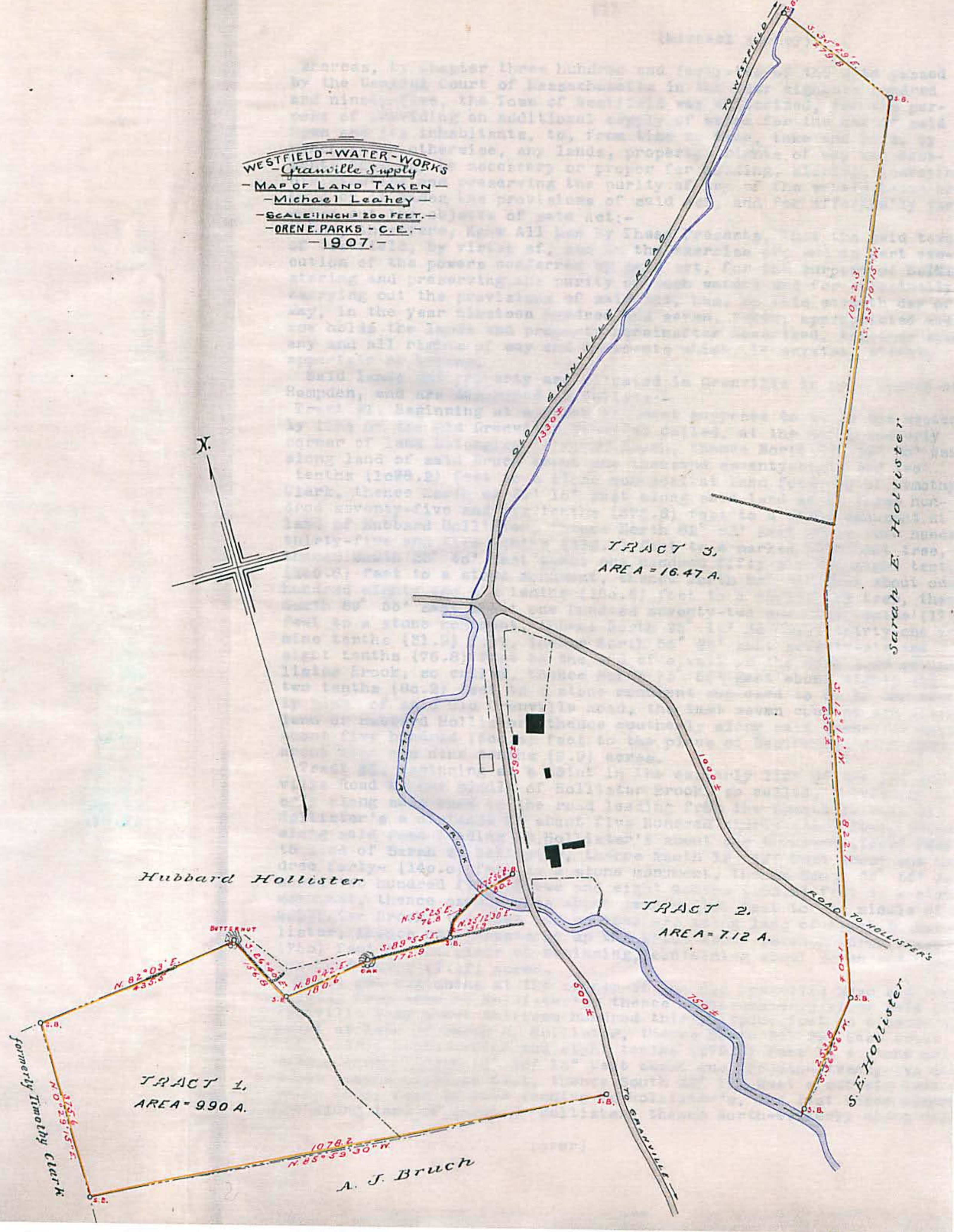
presence of Oren E. Parks

HAMPDEN COUNTY REGISTRY OF DEEDS.

4050

MAY 9 1907

Received 4 H. 12 M. P.M.


WESTFIELD-WATER-WORKS
-Granville Supply-
-MAP OF LAND TAKEN-
-Michael Leahey-
-SCALE: 1 INCH = 200 FEET.-
-OREN E. PARKS - C.E.-
-1907.-
N.
TO WESTFIELD
OLD GRANVILLE ROAD
1330±
S.35°29'E.
479.8
S.B.
1022.3
S.23°10'15"W.
Sarah E. Hollister
TRACT 3.
AREA = 16.47 A.
S.12°12'W.
650±
822.7
1000±
590±
HOLLISTER BROOK
ROAD TO HOLLISTER'S
140±
TRACT 2.
AREA = 7.12 A.
750±
1000±
S.E.Hollister
S.B.
TO GRANVILLE
Hubbard Hollister
BUTTERNUT
OAK
N.82°03'E.
433.5
S.26°40'E.
156.8
N.80°42'E.
180.6
S.89°55'E.
172.9
N.55°25'E.
76.8
N.23°12'30"E.
31.9
80.2
S.B.
TRACT 1.
AREA = 9.90 A.
375.6
N.0°29'15"E.
1078.2
N.85°59'30"W.
formerly Timothy Clark
A. J. Bruch

(Michael Leahey)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefore, Know All Men By These Presents, that the said town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said act, has, on this seventh day of May, in the year nineteen hundred and seven, taken, appropriated and now holds the lands and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong,

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

Tract #1. Beginning at a stone monument supposed to be in the westerly line of the Old Granville Road, so called, at the north-easterly corner of land belonging to A. J. Bruch, thence North 85° 59' 30" West along land of said Bruch about one thousand seventy-eight and two tenths (1078.2) feet to a stone monument at land formerly of Timothy Clark, thence North 00° 29' 15" East along said land about three hundred seventy-five and six tenths (375.6) feet to a stone monument at land of Hubbard Hollister, thence North 82° 03' East about four hundred thirty-five and five tenths (435.5) feet to a marked butternut tree, thence South 26° 40' East about one hundred fifty-six and eight tenths (156.8) feet to a stone monument, thence North 80° 42' East about one hundred eighty and six tenths (180.6) feet to a marked oak tree, thence South 89° 55' East about one hundred seventy-two and nine tenths (172.9) feet to a stone monument, thence North 25° 12' 30" East thirty-one and nine tenths (31.9) feet, thence North 55° 25' East seventy-six and eight tenths (76.8) feet to the end of a wall on the west side of Hollister Brook, so called, thence North 75° 56' East about eighty and two tenths (80.2) feet to a stone monument supposed to be in the westerly line of said Old Granville Road, the last seven courses are along land of Hubbard Hollister, thence southerly along said Granville Road about five hundred (500.0) feet to the place of beginning, containing about nine and nine tenths (9.9) acres.

Tract #2. Beginning at a point in the easterly line of the Old Granville Road at the middle of Hollister Brook, so called, thence northerly along said road to the road leading from the Granville road to Hollister's a distance of about five hundred ninety (590) feet, thence along said road leading to Hollister's about one thousand (1000) feet to land of Sarah E. Hollister, thence South 12° 12' West about one hundred forty- (140.0) feet to a stone monument, thence South 36° 56' West about two hundred fifty-three and eight tenths (253.8) feet to a stone monument, thence same course about twenty (20) feet to the middle of Hollister Brook, the last two courses are along land of Sarah E. Hollister, thence north-westerly up the brook about seven hundred fifty (750) feet to the place of beginning, containing about seven and twelve one-hundredths (7.12) acres.

Tract #3. Beginning at the corner of the Old Granville Road and road leading from same to Hollister's, thence North-easterly along said Old Granville Road about thirteen hundred thirty (1330) feet to a stone monument at land of Sarah E. Hollister, thence South 35° 29' East about two hundred seventy-nine and eight tenths (279.8) feet to a stone monument, thence South 23° 10' 15" West about one thousand twenty-two and three tenths (1022.3) feet, thence South 12° 12' West about six hundred fifty (650) feet to road leading to Hollister's, the last three courses are along land of Sarah E. Hollister, thence North-westerly along said

(over)

(Michael Leahey)

road about one thousand (1ooo) feet to the place of beginning, containing about sixteen and forty-seven one-hundredths (16.47) acres.
The three foregoing described tracts are supposed to belong to Michael Leahey of said Granville.
In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

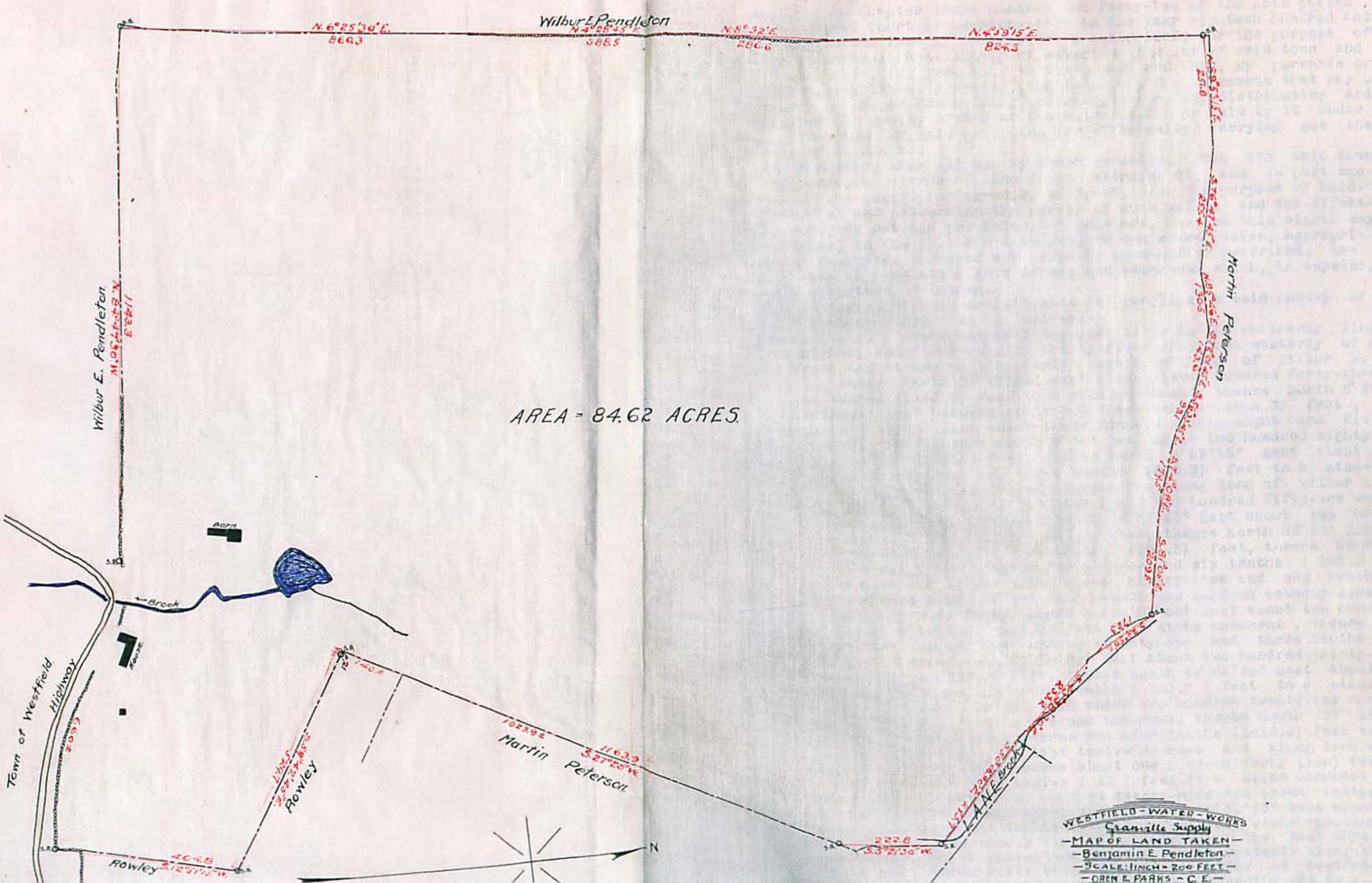
Board of
Water Commissioners.

S. W. Hildreth.
J. H. Packard
Thomas Little

In the presence of Oren E. Parks

4031

HAMPDEN COUNTY REGISTRY OF DEEDS.
MAY 9 1907
Received 4 H. 12 M. P.M.


Wilbur E. Pendleton
N.6°25'30"E.
869.3
N.4°28'45"E.
388.5
N.5°32'E.
286.6
N.4°19'15"E.
824.3
N.29°53'15"E.
251.8
S.76°47'45"E.
255.4
N.85°46'E.
130.5
S.72°01'45"E.
143.6
S.56°33'45"E.
99.1
S.74°08'E.
177.5
S.81°05'E.
209.6
Martin Peterson
178.3
233.2
151.7
LANE
Brook
222.8
S.3°21'30"W.
1163.9
S.27°28'W.
1023.92
Martin Peterson
120.4
12
Rowley
S.59°42'45"E.
524.7
Rowley
404.8
S.12°51'15"W.
660±
Highway
Town of Westfield
House
Barn
Brook
Wilbur E. Pendleton
1143.3
N.84°47'30"W.
AREA = 84.62 ACRES
N
WESTFIELD - WATER - WORKS
Granville Supply
MAP OF LAND TAKEN
Benjamin E. Pendleton
SCALE: 1 INCH = 200 FEET
OREN E. PARKS - C.E.

(Benjamin E. Pendleton)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefor, Know All Men By These Presents, that the said town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said act, has, on this eighth day of November, in the year nineteen hundred and seven, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said land and property are situated in Granville in said County of Hampden, and are described as follows:-

Commencing at a stone monument supposed to be in the northerly line of the highway about one hundred thirty-five (135) feet westerly of a small brook and at the northeasterly corner of land of Wilbur E. Pendleton, thence North 84° 47'3o" West about eleven hundred forty-three and three tenths (1143.3) feet to a stone monument, thence North 6° 25' 3o" East about eight hundred sixty and three tenths (86o.3) feet, thence North 4° 28'45" East about three hundred eighty-eight and five tenths (388.5) feet, thence North 8° 32' East about two hundred eighty-six and six tenths (286.6) feet, thence North 4° 59'15" East about eight hundred twenty-four and three tenths (824.3) feet to a stone monument, the foregoing described courses are along land of Wilbur E. Pendleton, thence North 89° 53'15" East about two hundred fifty-one and eight tenths (251.8) feet, thence South 76° 47'45" East about two hundred fifty-five and four tenths (255.4) feet, thence North 85° 46' East about one hundred thirty and five tenths (13o.5) feet, thence South 72° o1'45" East about one hundred forty-three and six tenths (143.6) feet, thence South 56° 33'45" East about ninety-nine and one tenth (99.1) feet, thence South 74° o8' East about one hundred seventy-nine and five tenths (179.5) feet, thence South 81° o5' East about two hundred nine and five tenths (2o9.5) feet to a stone monument , thence South 29° 58' East about one hundred seventy-two and three tenths (172.3) feet, thence South 43° 38'3o" East about two hundred thirty-three and two tenths (233.2) feet, thence South 5o° oo'3o" East about two hundred eighty-three and seven tenths (283.7) feet to a stone monument, thence South 5° 21'3o" West about two hundred twenty-two and eight tenths (222.8) feet to a stone monument, thence South 27° 28' West about one thousand twenty-three and nine tenths (1o23.9) feet to land of Christiana Rowley, the last twelve courses are along land of Martin Peterson, thence same course about one hundred forty (14o) feet, thence South 59° 42'45" East twelve (12) feet to a stone monument, thence same course about five hundred twenty-nine and seven tenths (529.7) feet to a stone monument, thence South 12° 51'15" West about four hundred four and eight tenths (4o4.8) feet to a stone monument supposed to be in the northerly line of the highway, the last three courses are along land of Christiana Rowley, thence westerly along the highway about six hundred sixty (66o) feet to the place of beginning; containing about eighty-four and sixty-two one-hundredths (84.62 A.) acres.

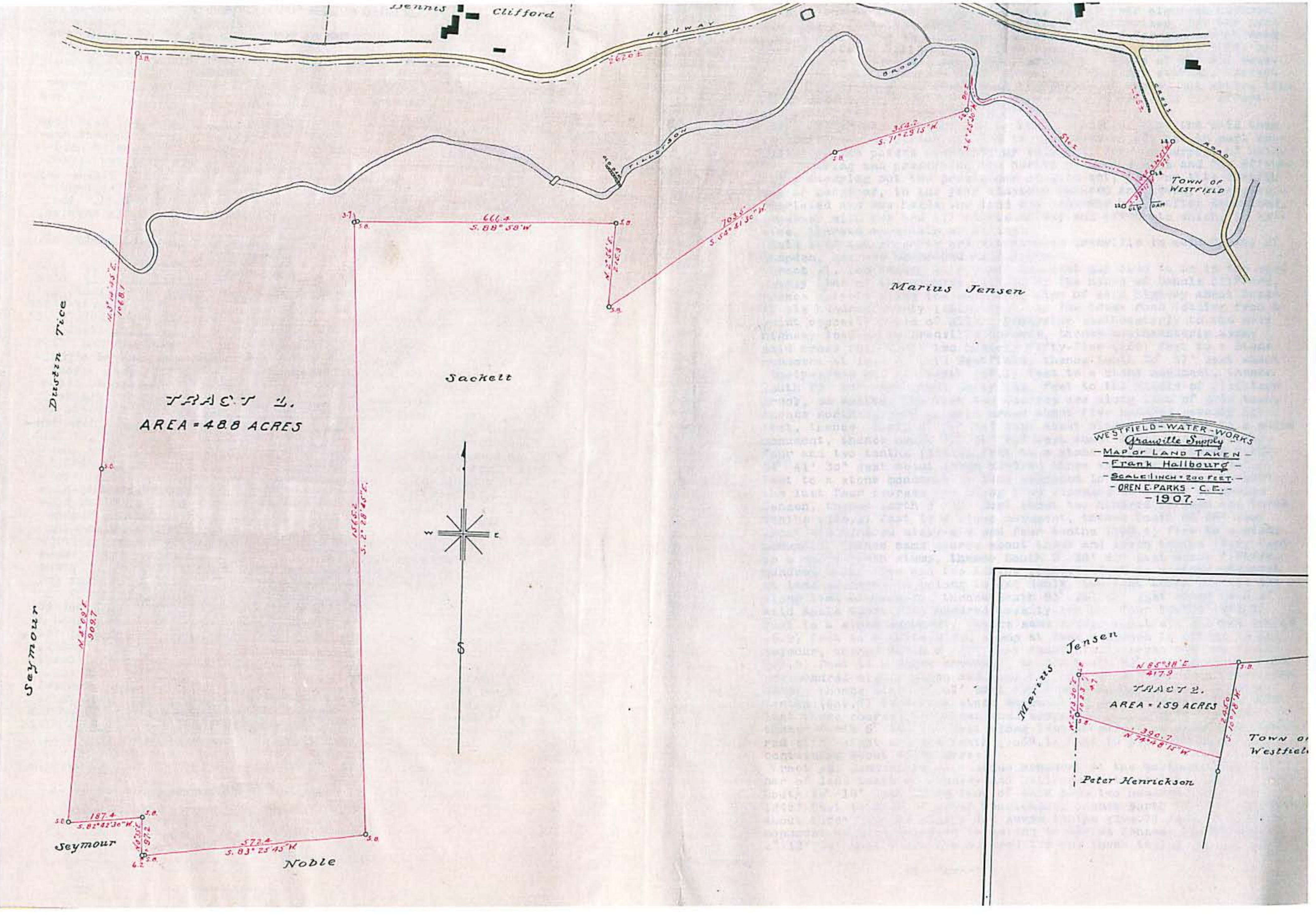
The foregoing described tract is supposed to belong to Benjamin E. Pendleton of said Granville.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of
Water Commissioners.

S. W. Hildreth
Thos Little

In the presence of H. W. Sanderson


WESTFIELD-WATER-WORKS
Granville Supply
-MAP OF LAND TAKEN-
-Frank Hallbourg-
-SCALE: 1 INCH = 200 FEET.-
-OREN E. PARKS - C.E.-
-1907.-
Dennis
Clifford
HIGHWAY
2620±
BROOK
TILLOTSON
OLD DAM
CROSS
ROAD
TOWN OF WESTFIELD
OLD DAM
516±
Marius Jensen
354.2
S. 71°29'15" W.
S. 6°25'30" W.
90±
703.5'
S. 54°41'30" W.
N. 2°56' E.
216.3
661.4
S. 88°58' W.
Sackett
Dustin Tice
TRACT 1.
AREA = 48.8 ACRES
N. 3°14'45" E.
1068.1
N. 4°09' E.
909.7
1565.2
S. 2°28'45" E.
W
E
S
Seymour
187.4
S. 82°42'30" W.
N. 2°57' E.
27.2
572.4
S. 83°25'45" W.
Noble
Marius
Jensen
N 85°38' E
417.9
N. 2°13'30" E.
107.3
TRACT 2.
AREA = 15.9 ACRES
245.0
S. 10°18' W.
390.7
N 74°48'15" W.
Peter Henrickson
Town of
Westfiel

(Frank Hallbourg)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefore, Know ALL Men By These Presents, that the said town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said act, has, on this twelfth day of December, in the year nineteen hundred and seven, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said land and property are situated in Granville in said County of Hampden, and are described as follows:-

Tract #1. Commencing at a stone monument supposed to be in the southerly line of the highway leading by the house of Dennis Clifford, thence easterly along the southerly line of said highway about twenty-six hundred twenty (262o) feet to the cross road leading from a point opposite house of Wilbur Pendleton southeasterly to the main highway leading to Granville Corners, thence southeasterly along said cross road about two hundred fifty-five (255) feet to a stone monument at land of said Westfield, thence South 3o° 57' West about ninety-seven and one tenth (97.1) feet to a stone monument, thence South 39° 17' West about forty (4o) feet to the middle of Tillotson Brook, so called, the last two courses are along land of said town, thence northwesterly up said brook about five hundred seventy (57o) feet, thence South 6° 25' 3o" West about ninety (9o) feet to a stone monument, thence South 71° 29' 15" West about three hundred fifty-four and two tenths (354.2) feet to a stone monument, thence South 54° 41' 3o" West about seven hundred three and five tenths (7o3.5) feet to a stone monument at land supposed to belong to one Sackett, the last four courses are along land supposed to belong to Marius Jensen, thence North 2° 56' East about two hundred fifteen and three tenths (215.3) feet to a stone monument, thence South 88° 58' West about six hundred sixty-six and four tenths (666.4) feet to a stone monument, thence same course about three and seven tenths (3.7) feet to a white-birch stump, thence South 2° 28' 45" East about fifteen hundred sixty-five and two tenths (1565.2) feet to a stone monument at land supposed to belong to one Noble, the last three courses are along land of Sackett, thence South 83° 25' 45" West along land of said Noble about five hundred seventy-two and four tenths (572.4) feet to a stone monument, thence same course about six and two tenths (6.2) feet to a white-birch stump at land supposed to belong to one Seymour, thence North o° 35' East about ninety-seven and two tenths (97.2) feet to a stone monument, thence South 82° 42' 3o" West about one hundred eighty-seven and four tenths (187.4) feet to a stone monument, thence North 4° o9' East about nine hundred nine and seven tenths (9o9.7) feet to a stone monument at land of Dustin Tice, the last three courses are along land supposed to belong to Seymour, thence North 3° 14' 45" East along land of said Tice about ten hundred sixty-eight and one tenth (1o68.1) feet to place of beginning, containing about 48.8o acres.

Tract #2. Commencing at a stone monument at the northwesterly corner of land taken of Plumley and Hallbourg October 1st., 19o1, thence South 1o° 18' West along land of said town two hundred forty-five (245) feet to land of Peter Henrickson, thence North 74° 48' 15" West about three hundred ninety and seven tenths (39o.7) feet to a stone monument at land supposed to belong to Marius Jensen, thence North 2° 13' 3o" East about one hundred two and three tenths (1o2.3) feet

(#1 "over")

to a stone monument, thence same course four and seven tenths (4.7) feet to a chestnut stump, thence North 85° 38' East about four hundred seventeen and nine tenths (417.9) feet to place of beginning, the last two courses are along land supposed to belong to Marius Jensen, containing about 1.59 acres.

The two foregoing described tracts are supposed to belong to Frank Hallbourg of said Westfield.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

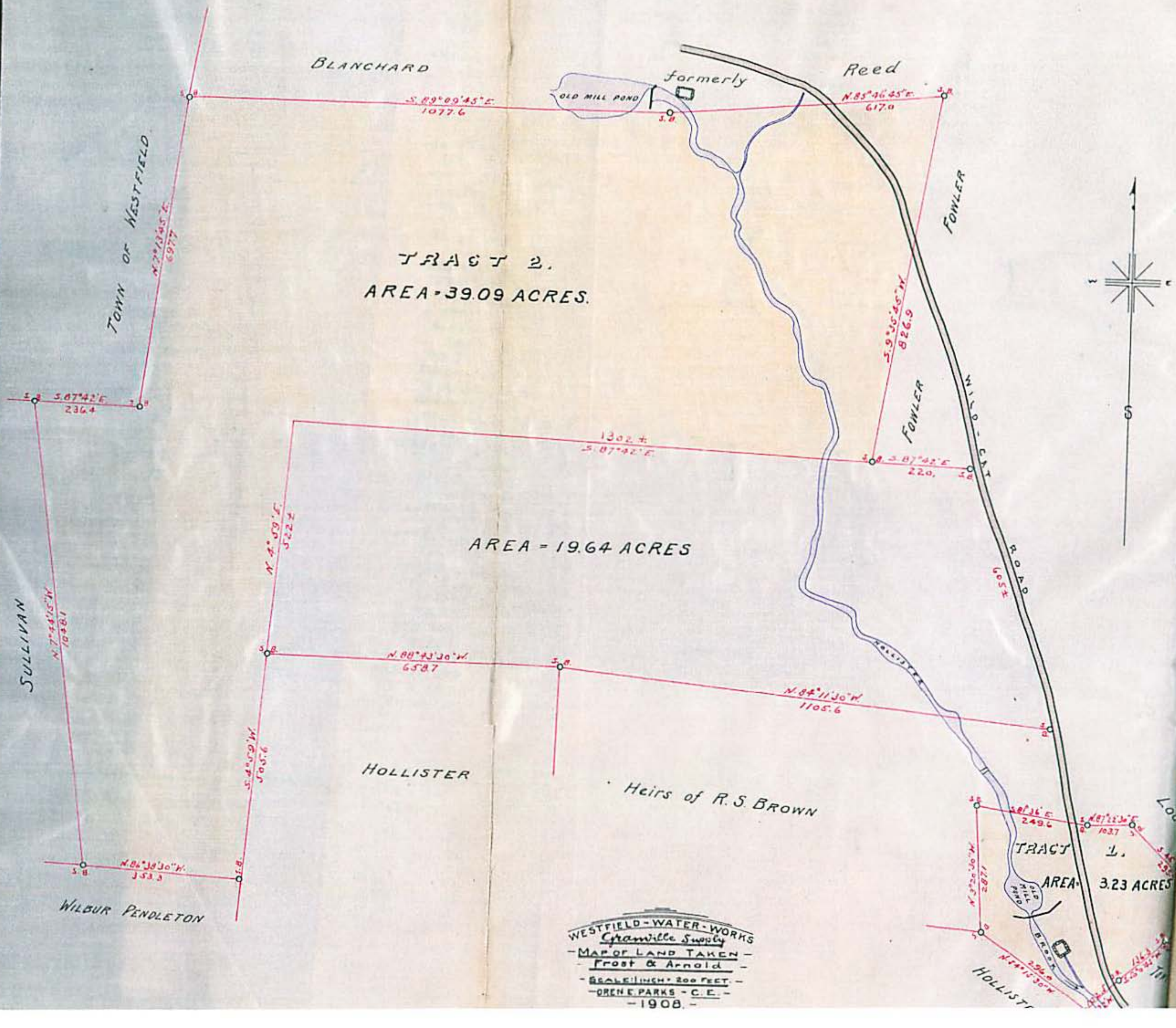
Board of
Water Commissioners.

L. W. Hildreth
Thomas Little

In the presence of H. W. Sanderson

11580

HAMPDEN COUNTY REGISTRY OF DEEDS.
DEC 30 1907
Received 2 H. 15 M. P.M.


BLANCHARD
formerly
Reed
OLD MILL POND
S.B.
S.89°09'45"E.
1077.6
N.85°46'45"E.
617.0
FOWLER
TOWN OF WESTFIELD
N.7°13'45"E.
697.7
TRACT 2.
AREA = 39.09 ACRES.
S.9°35'45"W.
826.9
FOWLER
WILD - CAT ROAD
605±
S.87°42'E.
234.4
1302.±
S.87°42'E.
S.87°42'E.
220.
N.4°59'E.
522±
AREA = 19.64 ACRES
SULLIVAN
N.7°44'15"W.
1038.1
N.88°43'30"W.
658.7
N.84°11'30"W.
1105.6
HOLLISTER
S.4°59'W.
505.6
HOLLISTER
Heirs of R.S. BROWN
N.86°38'30"W.
353.3
WILBUR PENDLETON
S.81°36'E.
249.6
N.87°22'30"E.
103.7
TRACT 1.
AREA = 3.23 ACRES
OLD MILL POND
N.3°20'30"W.
287.1
BROOK
N.54°15'30"W.
296.0
HOLLISTER
136.3
S
WESTFIELD - WATER - WORKS
Granville Supply
- MAP OF LAND TAKEN -
- Frost & Arnold -
- SCALE: 1 INCH = 200 FEET. -
- OREN E. PARKS - C.E. -
- 1908. -

(Harriet M. Frost)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, Therefor, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this second day of March, in the year nineteen hundred and eight, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said land and property are situated in Granville in said County of Hampden, and are described as follows:-

Commencing at a stone monument on the westerly side of the Wild-cat road and at the northeasterly corner of land of the Heirs of R. S. Brown thence North 84° 11'3o" West along land of said Heirs about eleven hundred five and six tenths (11o5.6) feet to a stone monument at land of Hubbard Hollister, thence North 88° 43'3o" West along land of said Hollister about six hundred fifty-eight and seven tenths (658.7) feet to a stone monument at land of Michael Arnold, thence North 4° 59' East about five hundred twenty-two (522) feet, thence South 87° 42' East about thirteen hundred two (13o2) feet to a stone monument at land of one Fowler, the last two courses are along land of said Arnold, thence same course along land of said Fowler about two hundred twenty (22o) feet to a stone monument on the westerly side of said Wild-cat road, thence southerly along said road about six hundred five (6o5) feet to the place of beginning, containing about 19.64 acres.

The foregoing described tract is supposed to belong to Harriet M. Frost of said Westfield.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

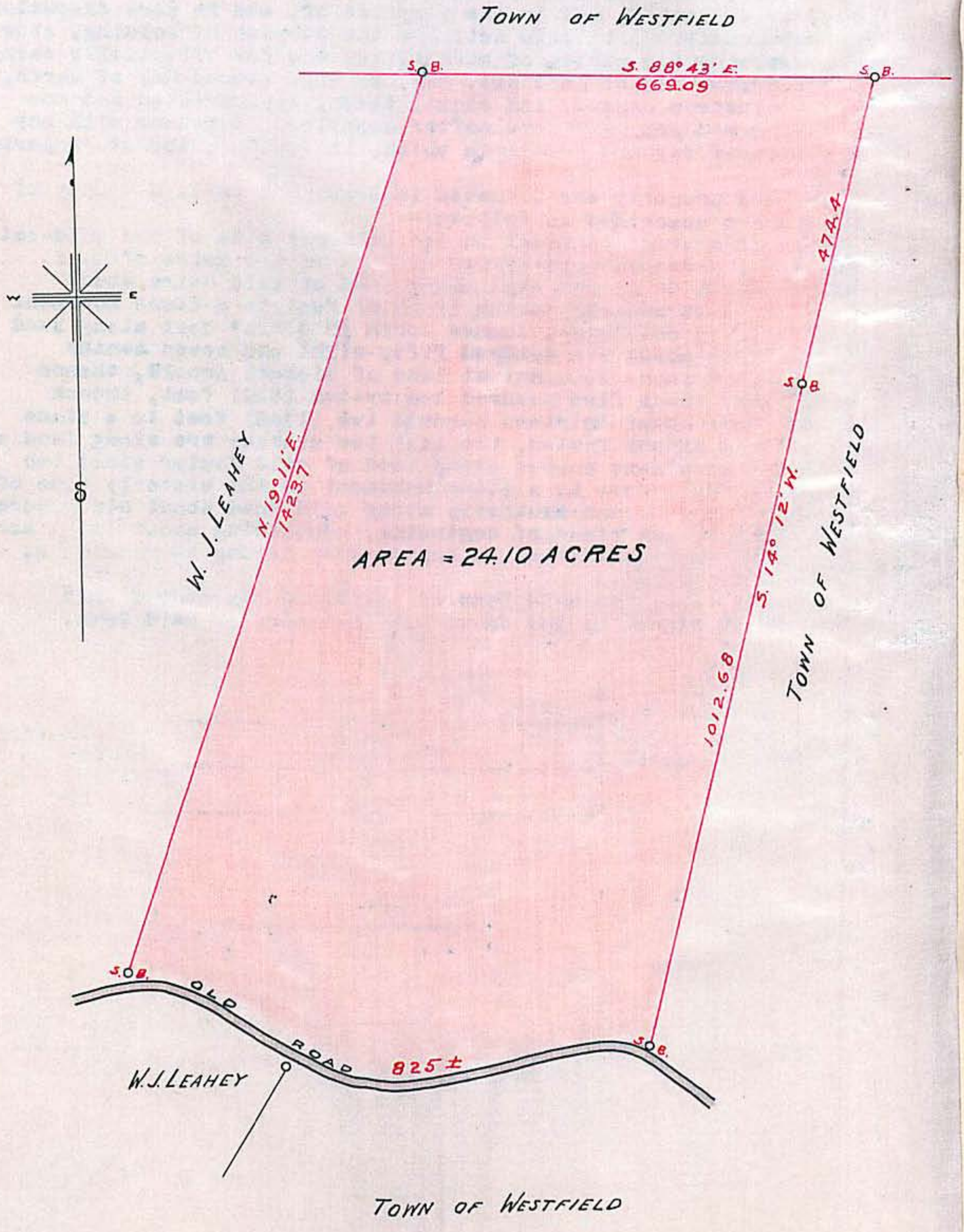
Board of (L. W. Hildreth
Water Commissioners. (Thos Little

In the presence of Orin E. Parks

2946

HAMPDEN COUNTY REGISTRY OF DEEDS.
APR 21 1908
Received 9 H. 05 M. a m

WESTFIELD - WATER - WORKS
- Granville Supply -
- MAP OF LAND TAKEN -
- Michael Arnold -
- SCALE: 1 INCH = 200 FEET. -
- OREN E. PARKS - C. E. -
- 1908 -



(Michael E. Arnold)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefor, Know All Men By These Presents, that the said town of Westfield, by virtue of ,and in the exercise of, and in part execution of the powers conferred by said act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said act, has, on this second day of March, in the year nineteen hundred and eight, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

Tract #1. Known as the Wells Mill lot; Commencing at a stone monument on the easterly side of the Wild-cat road, so called, at the corner of land of said Inhabitants, formerly of Wm. J. Leahey, thence South 46° 32' West, crossing said road and the brook, one hundred two and five tenths (1o2.5) feet to a stone monument, thence North 54° 15' 3o" West two hundred ninety-six (296) feet to a stone monument, the last two courses are along land supposed to belong to Hubbard Hollister thence North 3° 2o'3o" West two hundred eighty-seven and one tenth (287.1) feet to a stone monument, thence South 81° 36' East crossing said Wild-cat road two hundred forty-nine and six tenths (249.6) feet to a stone monument, the last two courses and westerly of said road are along land supposed to belong to the Heirs of R. S. Brown, thence North 87° 22'3o" East one hundred three and seven tenths (1o3.7) feet to a stone monument, thence South 44° 11' East two hundred ninety-five and nine tenths (295.9) feet to a stone monument, thence South 23° o7' West one hundred and three tenths (1oo.3) feet to a stone monument at land of Inhabitants of Town of Westfield, the last three courses are along land supposed to belong to one Loomis, thence North 65' 53' West along land of said Inhabitants eighty-nine and eight tenths (89.8) feet to a stone monument, thence South 5o° oo'45" West one hundred thirty-six and three tenths (136.3) feet to the place of beginning; containing about three and twenty-three one-hundredths (3.23) acres.

Tract #2. Commencing at a stone monument in the northerly line of land formerly of Harriet Frost and distant westerly about two hundred twenty (22o) feet from the Wild-cat road, thence North 87° 42' West about thirteen hundred two (13o2) feet, thence South 4° 59' West about five hundred twenty-two (522) feet to a stone monument at land of Hubbard Hollister, the last two courses are along land formerly of Harriet Frost, thence same course along land of Hubbard Hollister five hundred five and six tenths (5o5.6) feet to a stone monument at land supposed to belong to Wilbur Pendleton, thence North 86' 38'3o" West along land of said Pendleton three hundred fifty-three and three tenths (353.3) feet to a stone monument at land supposed to belong to Jerry Sullivan, thence North 7° 44'15" West along land of said Sullivan about one thousand forty-eight and one tenth (1o48.1) feet to a stone monument at land of Town of Westfield, thence South 87° 42' East two hundred thirty-six and four tenths (236.4) feet to a stone monument, thence north 7° 13'45" East six hundred ninety-seven and seven tenths (697.7) feet to a stone monument at land of one Blanchard, the last two courses are along land of Town of Westfield, thence South 89° o9'45" East one thousand seventy-seven and six tenths (1o77.6) feet to a stone monument below Reed's Mill Dam, so called, thence North 85° 46'45" East crossing the Wild-cat road, six hundred seventeen (617.o) feet to a stone monumentat land supposed to belong to one Fowler, the last two courses are along land supposed to belong to one Blanchard and known as Reed place, thence South 9° 35'45" West along land of one Fowler and recrossing said road, eight hundred twenty-six and nine tenths (826.9) feet to place of beginning; containing 39.o9 acres.

Tract #3. Commencing at a stone monument on the northerly side of the old road from the Carlton Strong place to Henry Winchell place and at the southwesterly corner of land of the Town of Westfield, formerly of James Andrews, thence westerly along said road about eight hundred twenty-five (825) feet to a stone monument at land of W. J. Leahey, thence North 19° 11' East along land of said Leahey fourteen hundred twenty-three and seven tenths (1423.7) feet to a stone monument at land of Town of Westfield, formerly of Plumley & Hallbourg, thence South 88° 43' East about six hundred sixty-nine and nine one-hundredths (669.09) feet to a stone monument, thence South 14° 12' West four hundred seventy-four and four tenths (474.4) feet to a stone monument, thence same course about one thousand twelve and sixty-eight one-hundredths (1012.68) feet to place of beginning; containing twenty-four and one tenth (24.1) acres.

The foregoing described tracts are supposed to belong to Michael E. Arnold of said Granville.

In witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

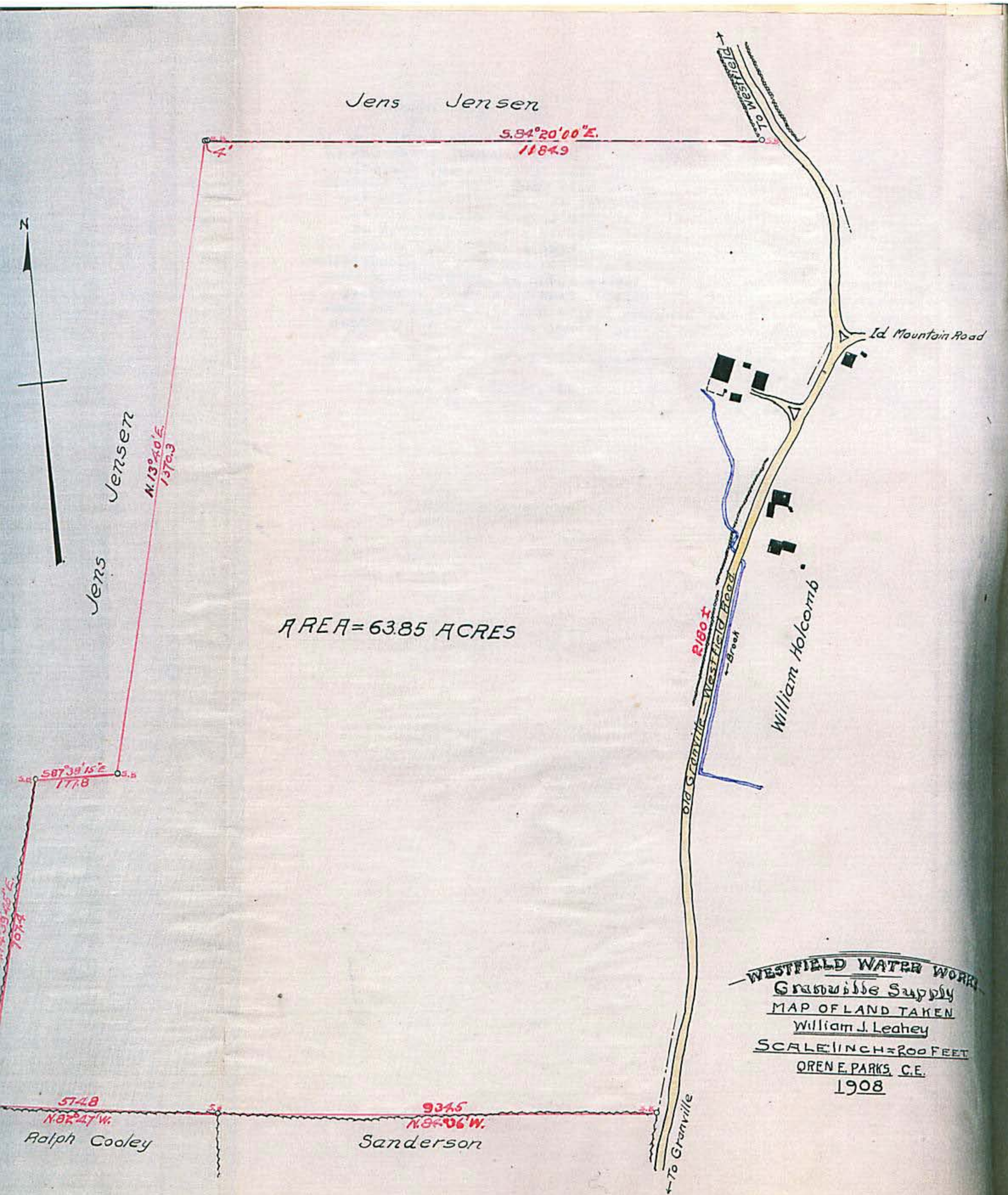
Board of
Water Commissioners.

S. W. T. Hildreth
Thos Little
S. A. Allen

In the presence of Omer E. Parks

2945

HAMPDEN COUNTY REGISTRY OF DEEDS.
APR 21 1908
Received 9 H. 05 M. a.m.



WESTFIELD WATER WORKS

Granville Supply

MAP OF LAND TAKEN

William J. Leahey

SCALE 1 INCH = 200 FEET

OREN E. PARKS, C.E.

1908

(William J. Leahey)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefor, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this first day of August, in the year nineteen hundred and eight, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

Commencing at a stone monument on the westerly side of the old Granville road and at the northeasterly corner of land supposed to belong to one Sanderson, thence North 84°36'West along land of said Sanderson about nine hundred thirty-four and five tenths (934.5) feet to a stone monument at land of Ralph Cooley, thence North 82°47'West along land supposed to belong to said Cooley about five hundred fourteen and eight tenths (514.8) feet to a stone monument at land of Jas. Gibbons Estate, thence North 14°39'45"East along land supposed to belong to said Gibbons Estate and land of Jens Jensen about seven hundred seven and four tenths (707.4) feet to a stone monument, thence South 87°38'15"East along land of said Jensen about one hundred seventy seven and eight tenths (177.8) feet to a stone monument, thence North 13°40'East along land of said Jensen about thirteen hundred seventy and three tenths (1370.3) feet to a chestnut stump, thence South 84°20'East four (4) feet to a stone monument, thence same course along land of said Jensen about eleven hundred eighty-four and nine tenths (1184.9) feet to a stone monument on the westerly side of the old Granville road, thence southerly along said road about two thousand one hundred and eighty (2180) feet to the place of beginning; containing about sixty-three and eighty-five one-hundredths (63.85) acres.

The foregoing described tract is supposed to belong to William J. Leahey of said Granville.

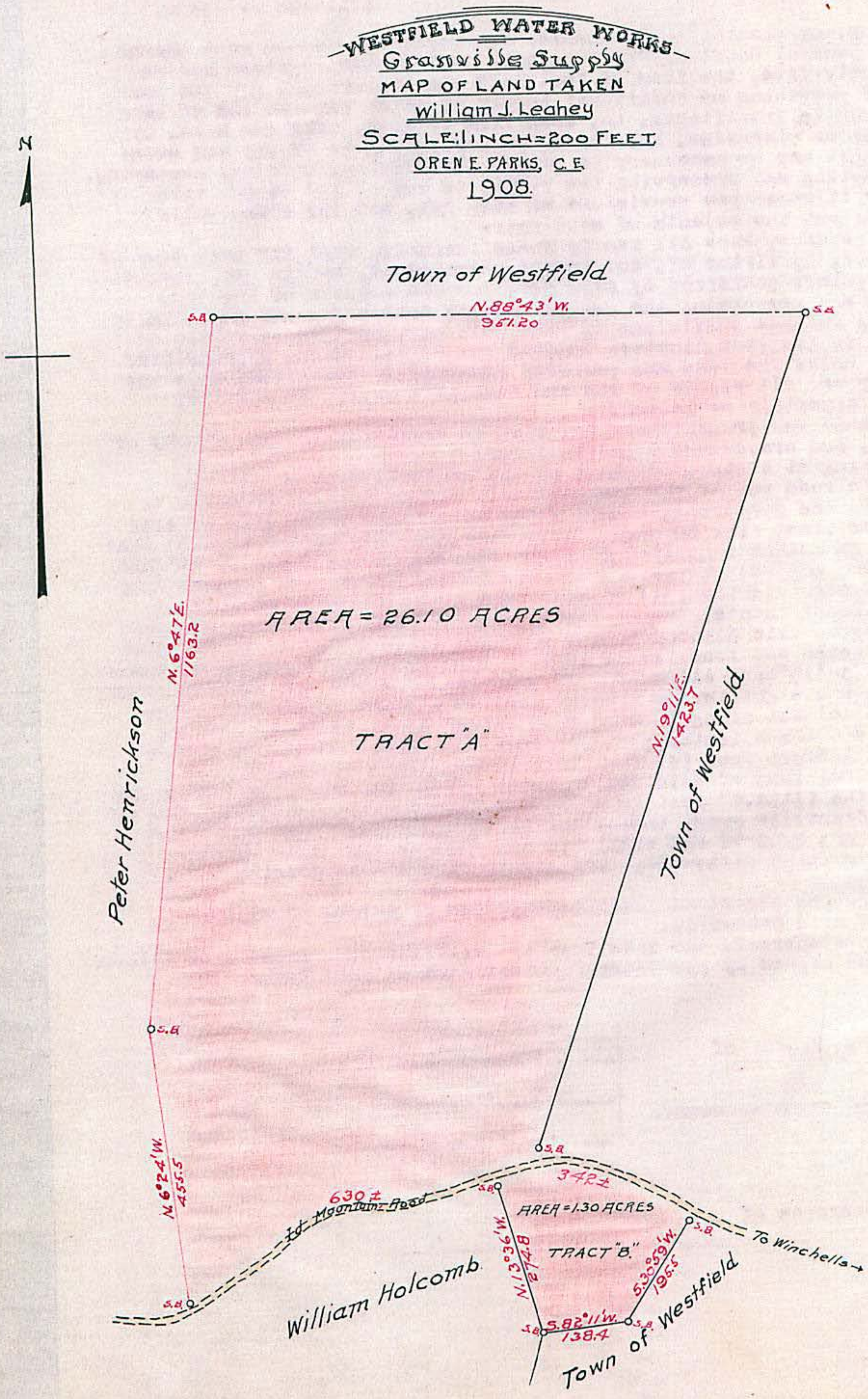
In witness whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of (S. N. C. Hildreth.
(S. A. Allen
Water Commissioners. (Thos Little

In the presence of C M Root

7108

HAMPDEN COUNTY REGISTRY OF DEEDS.
AUG 26 1908
Received 10 H 30 M a m



WESTFIELD WATER WORKS
Granville Supply
MAP OF LAND TAKEN
William J. Leahey
SCALE: 1 INCH = 200 FEET.
OREN E. PARKS, C. E.
1908.

(William J. Leahey)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefor, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this first day of August, in the year nineteen hundred and eight, taken, appropriated and now holds the lands and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

Tract "A". Commencing at a stone monument on the northerly side of the Id Mountain road (so called) and at the southwesterly corner of land of the Town of Westfield, thence westerly along said road about six hundred thirty (630) feet to a stone monument at land of Peter Henrickson, thence North 6°24'West along land of said Henrickson about four hundred fifty-five and five tenths (455.5) feet to a stone monument, thence North 6°47'East along land of said Henrickson about eleven hundred sixty-three and two tenths (1163.2) feet to a stone monument at land of Town of Westfield, thence South 88°43'East along land of said Town about nine hundred fifty-one and two tenths (951.2) feet to a stone monument, thence South 19°11'West along land of said Town about fourteen hundred twenty-three and seven tenths (1423.7) feet to the place of beginning; containing about twenty-six and one tenth (26.1) acres.

Tract "B". Commencing at a stone monument on the southerly side of the Id Mountain road at the northwesterly corner of land of the Town of Westfield, thence South 30°59'West about one hundred ninety-five and five tenths (195.5) feet to a stone monument, thence South 82°11' West about one hundred thirty-eight and four tenths (138.4) feet to a stone monument, the last two courses are along land of said Town, thence North 13°36'West along land of William Holcomb about two hundred seventy-four and eight tenths (274.8) feet to a stone monument on the southerly side of said road, thence easterly along said road about three hundred forty-two (342) feet to the place of beginning; containing about one and three tenths (1.3) acres.

The foregoing described tracts are supposed to belong to William J. Leahey of said Granville.

In witness whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of (S. N. Hildreth.
(S. A. Allen
Water Commissioners. (Thos Little

In the presence of C M Root

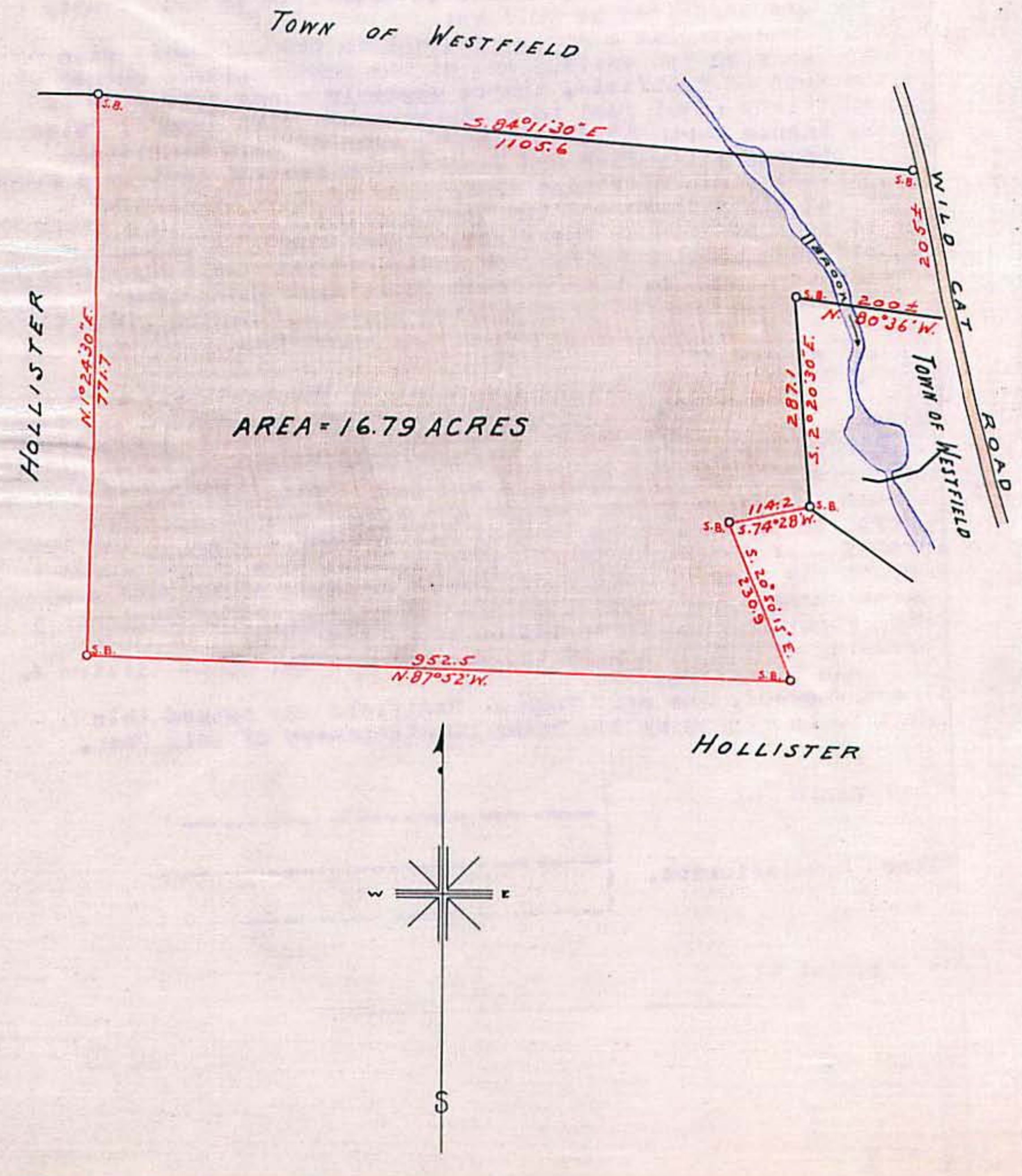
7109

HAMPDEN COUNTY REGISTRY OF DEEDS

AUG 26 1908

Received 10 H 30 M a m

WESTFIELD-WATER-WORKS
Granville Supply
-MAP OF LAND TAKEN-
-Lucy M. Brown, et als.-
-SCALE: 1 INCH = 200 FEET.-
-OREN E. PARKS - C. E.-
-1908.-



(Lucy M. Brown, et. als.)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefor, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this first day of July, in the year nineteen hundred and eight, taken, appropriated and now holds the land and property hereinafter described together with any and all rights of way and easements which, in anywise thereto appertain or belong.

Said land and property are situated in Granville in said County of Hampden, and are described as follows:-

Commencing at a stone monunent on the westerly side of the Wild-cat road(so called) at the southeasterly corner of land of the Town of Westfield taken of Harriet M. Frost, thence southerly along said highway about two hundred five (205) feet to land of said Town, taken of Michael E. Arnold and Know as the Wells Mill Lot, thence North 80° 36' West about two hundred (200) feet to a stone monument, thence South 2°20'30" East two hundred eighty-seven and one tenth (287.1) feet to a stone monument, the last two courses are along land of said Town, thence South 74°28' West about one hundred fourteen and two tenths (114.2) feet to a stone monument, thence South 20°50'15" East about two hundred thirty and nine tenths (230.9) feet to a stone monument, thence North 87°52' West about nine hundred fifty-two and five tenths (952.5) feet to a stone monument, thence North 1°24'30" East about seven hundred seventy-one and seven tenths (771.7) feet to a stone monument at land of said Town, the last four courses are along land of Hubbard Hollister, thence South 84°11'30" East along land of said Town about eleven hundred five and six tenths (11o5.6) feet to the place of beginning, containing about sixteen and seventy-nine one-hundredths (16.79) acres.

The foregoing described tract is supposed to belong to Lucy M. Brown and others of said Granville.

In witness whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of
Water Commissioners.

S. W. Hildreth
Thos Little
S. A. Allen

In the presence of H W Sanderson

8554

HAMPDEN COUNTY REGISTRY OF DEEDS.
OCT 8 1908
Received 9 H 50 M am

Westfield Water Works - Granville Supply - Description of land Taken & Location Maps - 1908

1908 Reports

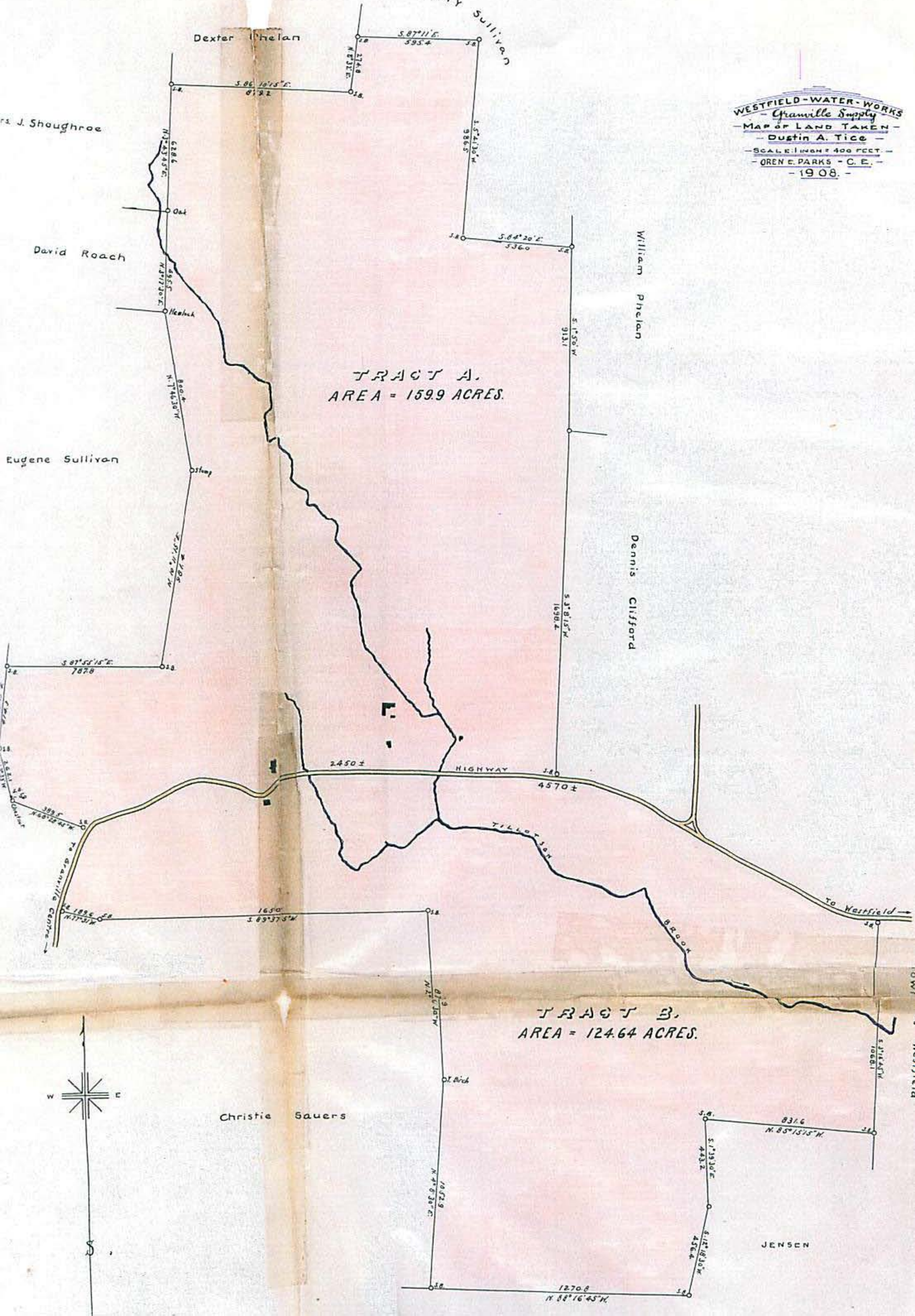
"Westfield Water Works - Granville Supply - Description of Lands Taken & Location Maps 1908". Filed Hampden County Registry of Deeds November 16, 1908, James R. Wells, Register. Chapter 342 Acts 1895.

City/Town	Granville
City/Town	Westfield
Name	Peck, L O
Name	Sullivan, Jerry
Name	Sullivan, Katie A
Name	Peck, A E
Name	Fowler, Joseph J
Name	Allen, Flavia J
Name	Winchell, Artemese
Name	Jones, Wilbur S
Name	Holcomb, Elizabeth A
Name	Holcomb, William O
Name	Consolatti, Stephen
Name	Carew, Justin G
Name	Kellogg, Eliza E
Name	Tice, Dustin A
Name	Sauers, Rosa M
Name	Bruch, A J

Name	Roach, David L
Name	Phelan, Mary J
Name	Pendelton, Wilbur
Name	Hollister, Sarah E
Name	Clifford, Dennis
Name	Hollister, Hubbard
Name	McDonald, Nellie Shoughrue
Name	Noble, Andelusia
Railroads	New York New Haven & Hartford Railroad Company
Railroads	Holyoke & Westfield Railroad
Streets	Granville Road
Streets	Northampton Road
Streets	Mountain Road
Streets	Old Granville Road
Streets	West Granville Road
Streets	Phelon Road
Streets	Wild Cat Road
Water	Munn's Brook
Water	Tillotson Brook
Water	Japhet Brook
Water	Hollister Brook
Water	Hollister Brook

WESTFIELD WATER WORKS
GRANVILLE SUPPLY
DESCRIPTION OF LANDS TAKEN AND LOCATION MAPS

1908



WESTFIELD-WATER-WORKS
- Granville Supply -
- MAP OF LAND TAKEN -
- Dustin A. Tice -
- SCALE: 1 INCH = 400 FEET. -
- OREN E. PARKS - C. E. -
- 1908. -

(Dustin A. Tice)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefor, KNOW ALL MEN BY THESE PRESENTS, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this seventeenth day of October, in the year nineteen hundred and eight, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise thereto appertain or belong.

Said land and property are situated in Granville in said County of Hampden, and are described as follows:-

Tract "A". Commencing at a stone monument on the westerly side of the highway leading from said Tice property to Granville Centre and at the southeasterly corner of land supposed to belong to John Roach, thence North 68°28'45" West about three hundred eighty-nine and five tenths (389.5) feet to a large chestnut tree, thence North 13°33'West about five (5) feet to a stone monument, thence same course about two hundred sixty-two and one tenth (262.1) feet to a stone monument,thence North 7°55'15"East about four hundred fourteen and three tenths (414.3) feet to a stone monument at land supposed to belong to Eugene Sullivan, the last three courses are along land of said Roach,thence South 87°55' 15" East about seven hundred eighty-seven and eight tenths (787.8) feet to a stone monument, thence North 10°11'15" East about nine hundred eighty-one and four tenths(981.4) feet to a stump on the northerly side of the brook, thence North 7°46'30" West about eight hundred and four tenths (800.4) feet to a hemlock tree at land supposed to belong to David Roach, the last three courses are along land of said Sullivan, thence North 3°17'30" East along land of said Roach about four hundred ninety-five and five tenths (495.5) feet to an oak tree at land supposed to belong to Mrs. Shoughroe, thence North 3°43'45" East along land of said Shoughroe about six hundred twenty-eight and six tenths(628.6)feet to a stone monument at land supposed to belong to Dexter Phelan, thence South 86°10'15" East about eight hundred seventy-nine and two tenths (879.2)feet to a stone monument, thence North 8°32' East about two hundred seventy-four and eight tenths (274.8) feet to a stone monument at land supposed to belong to Jerry Sullivan, the last two courses are along land of said Phelan, thence South 87°11' East about five hundred ninety-five and four tenths (595.4) feet to a stone monument, thence South 5° 41' 30" West about nine hundred eighty-six and five tenths (986.5) feet to a stone monument, thence South 84°20' East about five hundred thirty-six (536) feet to a stone monument at land supposed to belong to William Phelan, the last three courses are along land of said Sullivan, thence South 1° 50' West along land of said Wm. Phelan about nine hundred thirteen and one tenth (913.1) feet to land supposed to belong to Dennis Clifford, thence South 3° 08' 15" West along land of said Clifford about sixteen hundred ninety-eight and four tenths (1698.4) feet to a stone monument supposed to be in the northerly line of the highway, thence westerly along the highway about twenty four hundred and fifty (2450) feet to the place of beginning; containing about one hundred fifty-nine and nine tenths (159.9) acres.

Tract "B". Commencing at a stone monument in the southerly line of the highway about eight hundred (800) feet westerly of the dwelling of Dennis Clifford and at the northwesterly corner of land of the Town of Westfield formerly of one Hallbourg, thence South 3°14'45" West along land of said Town about ten hundred sixty-eight and one tenth (1068.1) feet to a stone monument at land supposed to belong to one Jensen, thence North 85°15'15" West about eight hundred thirty-one and six tenths (831.6) feet to a stone monument, thence South 1°39'30" East about four hundred forty-three and two tenths (443.2) feet, thence South 12°18'30" West about four hundred fifty-six and four tenths(456.4) feet to a stone monument at land supposed to belong to Stephen Seymour, the last three courses are along land of said Jensen, thence North 88° 16'45" West along land of said Seymour about twelve hundred seventy and eight tenths (1270.8) feet to a stone monument at land supposed to belong to Christie Sauers, thence North 4°08'30" East about ten hundred fifty-two and nine tenths (1052.9) feet to a marked yellow birch, thence North 2°36'30" West about eight hundred seventy and nine tenths (870.9) feet to a stone monument, thence South 89°37'45" West about sixteen hundred fifty (1650) feet to a stone monument, thence North 77°31' West about one hundred eighty-nine and six tenths (189.6) feet to a stone monument in the easterly line of the highway, the last four courses are along land of said Sauers, thence northerly and easterly along the highway about forty-five hundred and seventy (4570) feet to the place of beginning; containing about one hundred twenty-four and sixty-four one-hundredths (124.64) acres.

The two foregoing described tracts are supposed to belong to Dustin A. Tice of said Granville.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

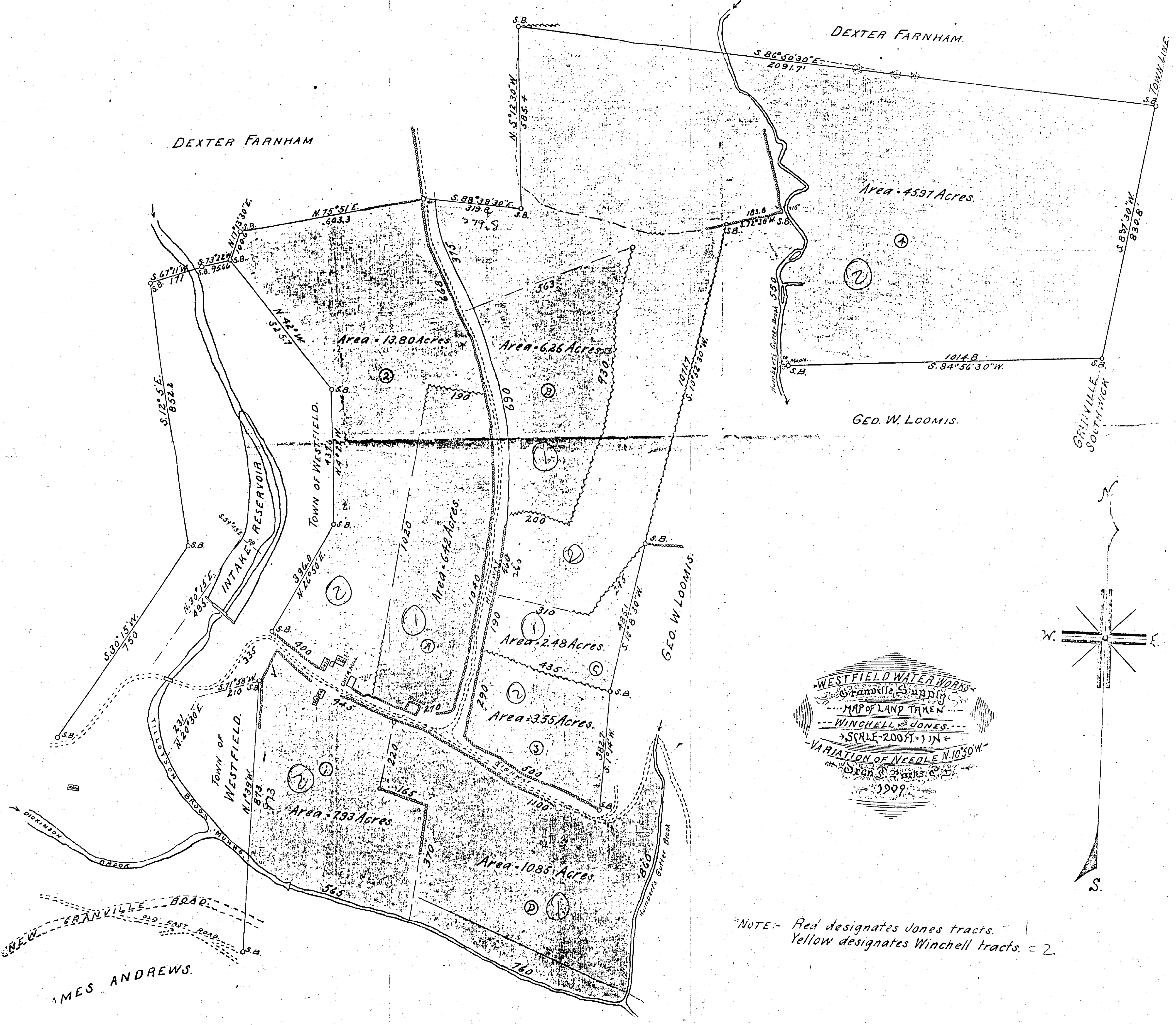
Board of
Water Commissioners.

S. W. Hildreth.
D. A. Allen
Thos Little

In the presence of John L. Hyde

9889

HAMPDEN COUNTY REGISTRY OF DEEDS.
NOV 16 1908
Received 10 H 11 M a.m.



WESTFIELD WATER WORKS
Granville Supply
MAP OF LAND TAKEN
WINCHELL AND JONES.
SCALE-200 FT.=1 IN
VARIATION OF NEEDLE N.10°50'W.
Oren E. Parks. C.E.
1909.

NOTE:- Red designates Jones tracts. = 1
Yellow designates Winchell tracts. = 2

(Artemese Winchell)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefore, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this first day of May, in the year nineteen hundred and nine, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said land and property are situated in Granville in said County of Hampden, and are described as follows:-

Tract #1. Commencing at an iron monument on the southerly side of the highway at the northwesterly corner of land of Wilbur Jones, thence southerly about two hundred twenty (220) feet, thence easterly about one hundred sixty-five (165) feet, thence southerly about three hundred seventy (370) feet to Munn's Brook, the last three courses are along land of said Jones, thence westerly up the brook about five hundred sixty-five (565) feet to land of the Town of Westfield, thence North 1°39' West about five hundred eighty (580) feet to a stone monument, thence South 71°58' West about two hundred ten (210) feet to the highway, the last two courses are along land of said Town, thence northerly and easterly along said highway about seven hundred eighty (780) feet to the place of beginning; containing about seven and ninety-three one-hundredths (7.93) acres.

Tract #2. Commencing at a stone monument in the northerly line of the highway at the southeasterly corner of land of the Town of Westfield, thence North 26°50' East about three ninety-six (396) feet to a stone monument, thence North 4°22' West about four hundred thirty-seven and six tenths (437.6) feet to a stone monument, thence North 42° West about five hundred twenty-five and seven tenths (525.7) feet to a stone monument at land of Dexter Farnham, the last three courses are along land of said Town, thence North 17°13'30" East about one hundred and six tenths (100.6) feet to a stone monument, thence North 75°51' East about six hundred three and three tenths (603.3) feet to a stone monument on the westerly side of the highway, the last two courses are along land of said Farnham, thence southerly along the highway about six hundred sixty-eight (668) feet to land of Wilbur Jones, thence westerly about one hundred ninety (190) feet, thence southerly about one thousand twenty (1020) feet to the highway, the last two courses are along land of said Jones, thence westerly along the highway about four hundred (400) feet to the place of beginning; containing about thirteen and eight tenths (13.8) acres.

Tract #3. Commencing at a stone monument in the northerly line of the old highway leading from the Winchell place to Lambson's, thence westerly along said highway about five hundred (500) feet to the highway leading northerly to Farnham's, thence northerly along said highway about two hundred ninety (290) feet to land of Wilbur S. Jones, thence easterly along land of said Jones about four hundred thirty-five (435) feet to a stone monument at land of Geo. W. Loomis, thence South 1°14' West along land of said Loomis about three hundred eighty-two and seven tenths (382.7) feet to the place of beginning; containing about three and fifty-five one-hundredths (3.55) acres.

Tract #4. Commencing at a point in the easterly line of the highway leading from Winchell's northerly to Farnham's, said point bearing South 88°38'30" East forty (40) feet from a stone monument in the westerly line of said road, thence same course about two hundred seventy-nine and eight tenths (279.8) feet to a stone monument, thence North 5°12'30"West about five hundred eighty-five and four tenths (585.4) feet to a stone monument, thence South 86°50'30"East about two thousand ninety-one and seven tenths (2091.7) feet to a stone monument in the Granville-Southwick Town Line, the last three courses are along land supposed to belong to Dexter Farnham, thence South 8°07'30"West along said Town Line about eight hundred thirty and eight tenths (830.8) feet to a stone monument at land of Geo. W. Loomis, thence South 84°56'30"West about one thousand fourteen and eight tenths (1014.8) feet to a stone monument, thence same course about twenty (20) feet to the middle of Humbert's Gutter Brook, thence northerly up the brook about five hundred fifty (550) feet, thence South 72°38'West about fifteen (15) feet to a stone monument, thence same course about one hundred eighty-three and eight tenths (183.8) feet to a stone monument, thence South 10°52'30"West about ten hundred seventy-one and seven tenths (1071.7) feet to a stone monument at land of Wilbur S. Jones, the last four courses are along land of said Loomis, thence southwesterly about two hundred ninety-five (295) feet, thence westerly about three hundred ten (310) feet to the highway, the last two courses are along land of said Jones, thence northerly along said highway about four hundred sixty (460) feet to other land of said Jones, thence easterly about two hundred (200) feet, thence northerly about nine hundred thirty (930) feet, thence southwesterly about five hundred sixty-three (563) feet to the highway, the last three courses are along land of said Jones, thence northerly along the highway about three hundred seventy-five (375) feet to the place of beginning; containing about forty-five and ninety-seven one-hundredths (45.97) acres.

The foregoing described tracts are supposed to belong to Artemese Winchell, widow of Henry M. Winchell of Granville.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of
Water Commissioners.

S. W. Hildreth
Thos Little

In the presence of

7283

HAMPDEN COUNTY REGISTRY OF DEEDS.

JUL 10 1909

Received 10 H 15 M a.m.

(Wilbur S. Jones)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefor, Know All Men By These Presents, that the said Town of Westfield, by virtueof, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this first day of May, in the year nineteen hundred and nine, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said land and property are situated in Granville in said County of Hampden, and are described as follows:-

Tract "A". Commencing at a point in the northerly line of the highway at the southeasterly corner of land formerly of Henry M. Winchell thence northerly about ten hundred twenty (1020) feet, thence easterly about one hundred ninety (190) feet to the highway leading to Farnham's, the last two courses are along land formerly of said Winchell, thence southerly along the highway about ten hundred forty (1040) feet, thence westerly along the highway about two hundred seventy (270) feet to the place of beginning; containing about six and forty-two one-hundredths (6.42) acres.

Tract "B". Commencing at a point in the easterly line of the road leading to Farnham's about three hundred seventy-five (375) feet southerly along said road from land supposed to belong to Farnham, thence northeasterly about five hundred sixty-three (563) feet, thence southerly about nine hundred thirty (930) feet, thence westerly about two hundred (200) feet to the highway, the last three courses are along land formerly of Henry M. Winchell, thence northerly along the highway about six hundred ninety (690) feet to the place of beginning; containing about six and twenty-six one-hundredths (6.26) acres.

Tract "C". Commencing at a point in the easterly line of the road leading to Farnham's about four hundred sixty (460) feet southerly along said road from the southwesterly corner of Tract "B", thence easterly about three hundred ten (310) feet, thence northeasterly about two hundred ninety-five (295) feet to a stone monument at land of George W. Loomis, the last two courses are along land formerly of Henry M. Winchell, thence South 10°08'30" West along land of said Loomis about four hundred eighty-five and one tenth (485.1) feet to a stone monument at land of said Winchell, thence westerly along land of said Winchell about four hundred thirty-five (435) feet to the highway, thence northerly along the highway about one hundred ninety (190) feet to the place of beginning; containing two and forty-eight one-hundredths (2.48) acres.

Tract "D". Commencing at an iron monument on the southerly side of the highway at the northeasterly corner of land formerly of Henry M. Winchell, thence easterly and northerly along said highway about eleven hundred (1100) feet to the middle of Humbert's Gutter Brook, thence southerly along said brook about eight hundred sixty (860) feet to its junction with Munn's brook, thence westerly along said Munn's brook about seven hundred sixty (760) feet to land formerly of said Winchell, thence northerly about three hundred seventy (370) feet, thence westerly about one hundred sixty-five (165) feet, thence northerly about two hundred twenty (220) feet to the place of beginning, the last three courses are along land formerly of said Winchell; containing about ten and eighty-five one-hundredths (10.85) acres.

(Wilbur S. Jones)

The foregoing described tracts are supposed to belong to Wilbur S. Jones of said Granville.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

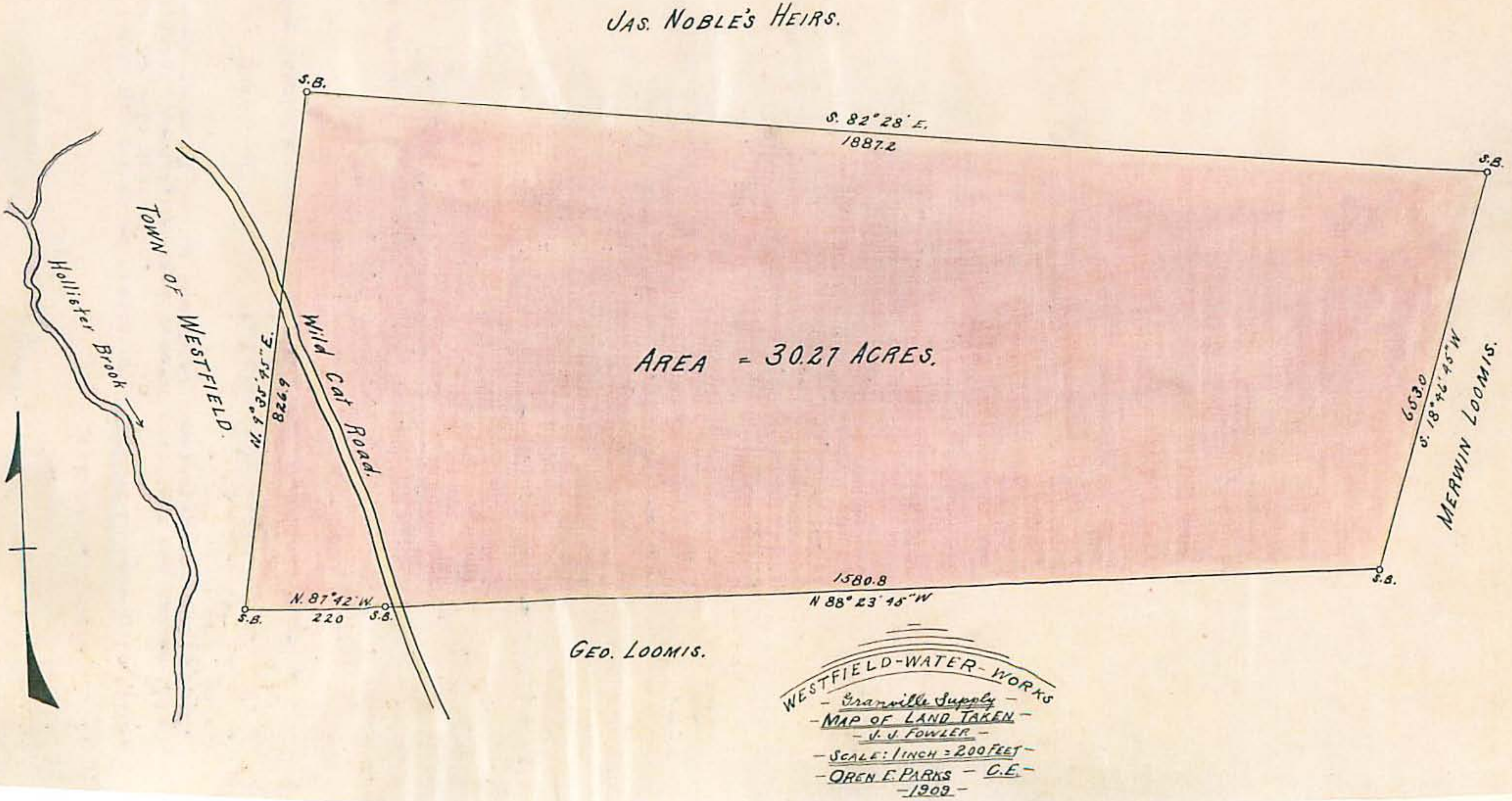
Board of
Water Commissioners.

S. W. Hildreth.
Wm Little

In the presence of

7284

HAMPDEN COUNTY REGISTRY OF DEEDS.
JUL 10 1909
Received 10 H 15 M a.m.


JAS. NOBLE'S HEIRS.
S.B.
S. 82° 28' E.
1887.2
S.B.
TOWN OF WESTFIELD.
Hollister Brook
N. 9° 35' 45" E.
826.9
Wild Cat Road.
AREA = 30.27 ACRES.
653.0
S. 18° 46' 45" W
MERWIN LOOMIS.
1580.8
N 88° 23' 45" W
S.B.
N. 87° 42' W.
S.B.
220
S.B.
GEO. LOOMIS.
WESTFIELD-WATER-WORKS
- Granville Supply -
- MAP OF LAND TAKEN -
- J. J. FOWLER -
- SCALE: 1 INCH = 200 FEET -
- OREN E. PARKS - C.E. -
- 1909 -

(Joseph J. Fowler)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefor, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this tenth day of April, in the year nineteen hundred and nine, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said land and property are situated in Granville in said County of Hampden, and are described as follows:-

Commencing at a stone monument on the westerly side of the Wild Cat road at the northeasterly corner of land of Town of Westfield, thence North 87°42'West about two hundred twenty (220) feet to a stone monument, thence North 9°35'45"East about eight hundred twenty-six and nine tenths (826.9) feet to a stone monument, the last two courses are along land of said Town, thence South 82°28'East along land supposed to belong to James Noble's Heirs about eighteen hundred eighty-seven and two tenths (1887.2) feet to a stone monument, thence South 18°46'45"West along land supposed to belong to Merwin Loomis about six hundred fifty-three (653) feet to a stone monument, thence North 88°23'45"West along land supposed to belong to George W. Loomis about fifteen hundred eighty and eight tenths (1580.8) feet to the place of beginning; containing about thirty and twenty-seven one-hundredths (30.27) acres exclusive of the highway.

The foregoing described tract is supposed to belong to Joseph J. Fowler of said Westfield.

In witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of Water Commissioners.

S. W. Hildreth.
[illegible] Little

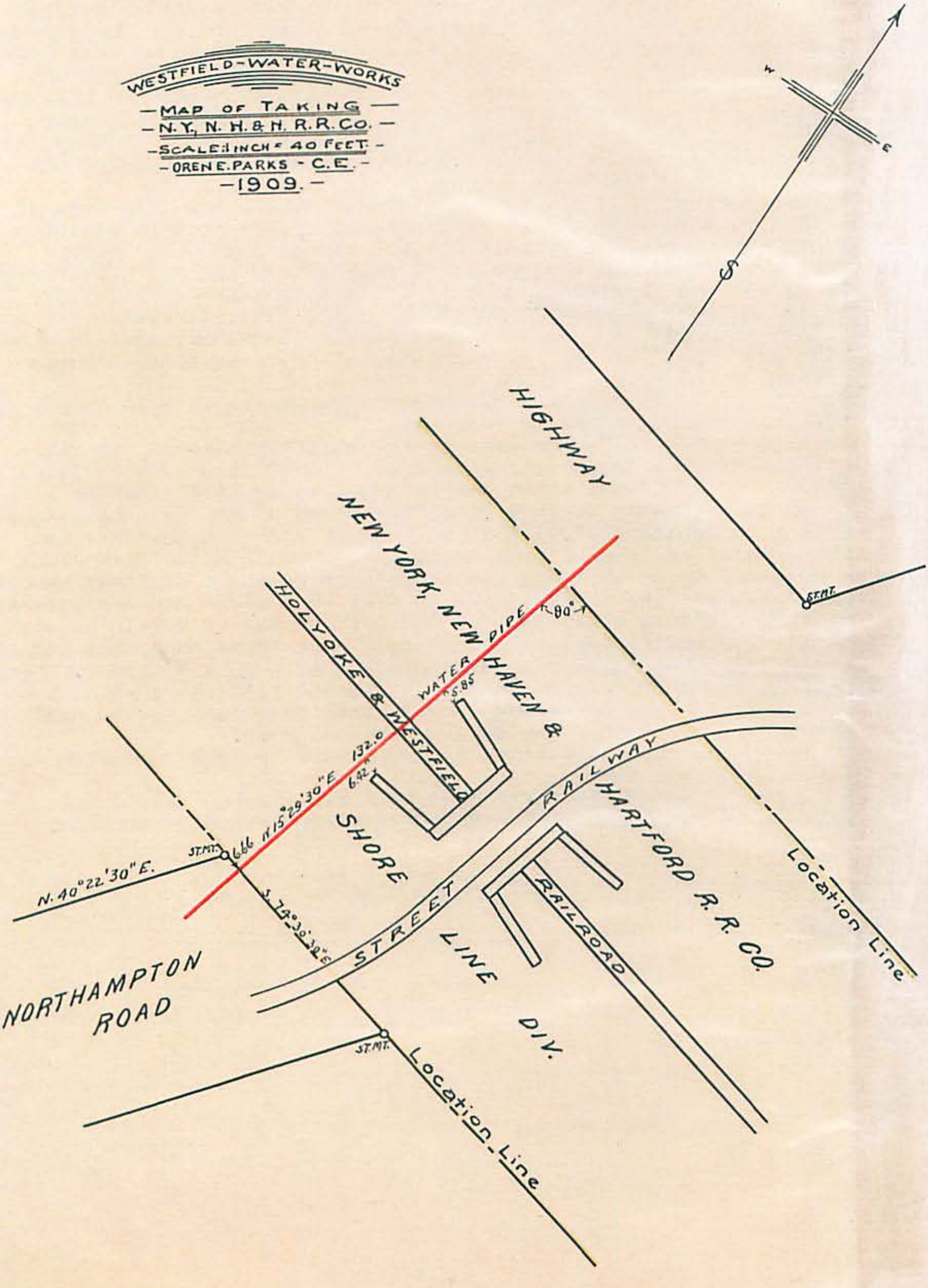
In the presence of

7285

HAMPDEN COUNTY REGISTRY OF DEEDS.
JUL 10 1909
Received 10 H 15 M a.m.

WESTFIELD-WATER-WORKS

MAP OF TAKING
N. Y., N. H. & H. R. R. Co.
SCALE: 1 INCH = 40 FEET.
OREN E. PARKS - C. E.
1909.



(New York,New Haven & Hartford R.R.)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefore Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of distributing such waters and for effectually carrying out the provisions of said Act, has, on this twenty-ninth day of October, in the year nineteen hundred and nine, taken the right to lay down , carry and maintain water pipe through, under and across the location of the Holyoke and Westfield Branch of the New York, New Haven & Hartford Railroad Co. along the following described line;-

Commencing at a point in the southerly location line of said Railroad Company bearing South 74°30'30" East six and sixty-six one-hundredths (6.66) feet from a stone monument at the intersection of said location line with the westerly line of the Northampton highway, so called, thence North 15°29'30" East one hundred thirty-two (132) feet to a point in the northerly location line of said Railroad Company.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

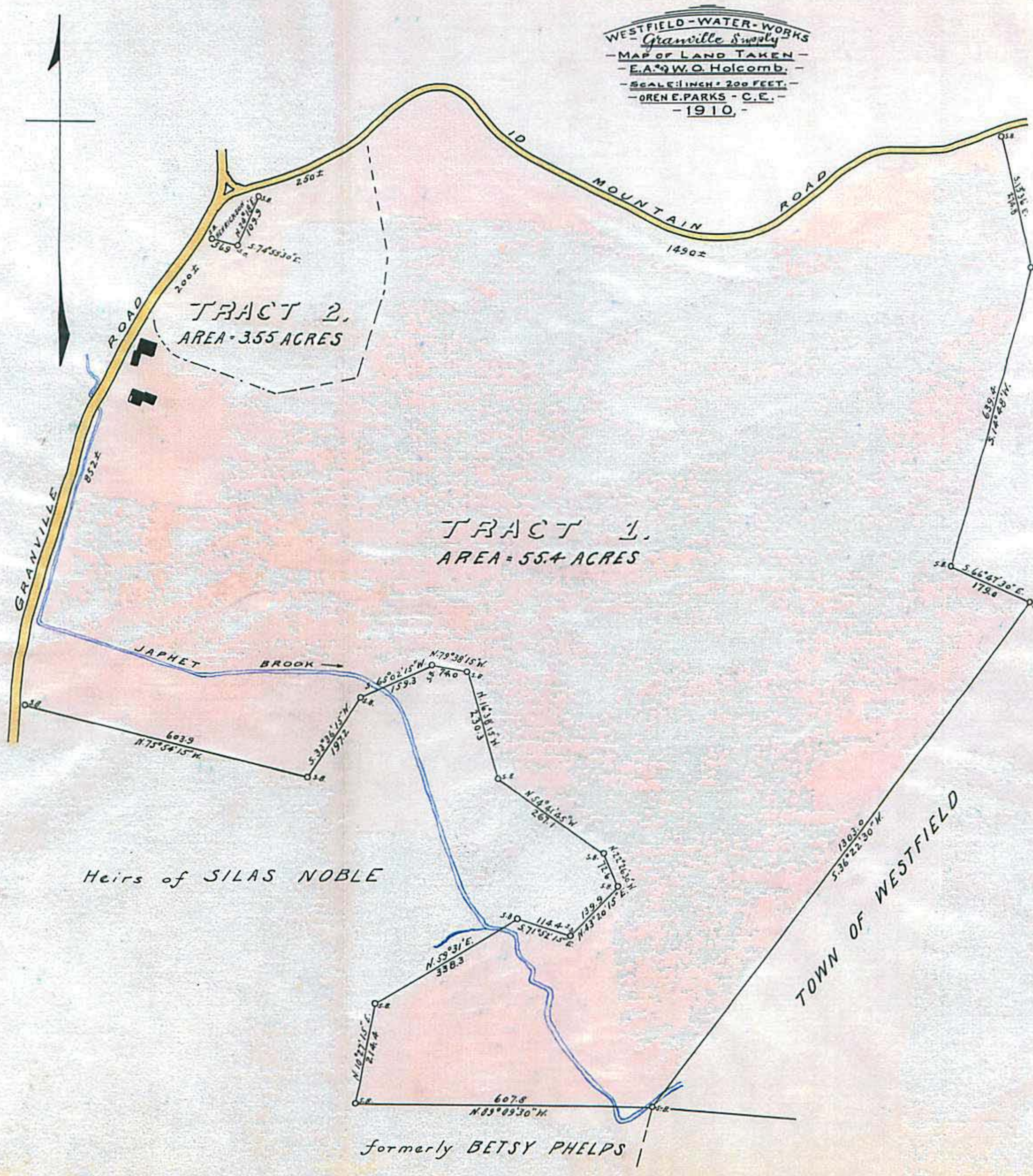
Board of
Water Commissioners.

S. W. Hildreth.
Vinz Little
S. A. Allen

In the presence of C. M. Root

12982

HAMPDEN COUNTY REGISTRY OF DEEDS.
DEC 10 1909
Received 4 H 55 M P.M.


WESTFIELD-WATER-WORKS
Granville Supply
MAP OF LAND TAKEN
E.A. & W.O. Holcomb.
SCALE: 1 INCH = 200 FEET.
OREN E. PARKS - C.E.
1910.

(Elizabeth A. & William O. Holcomb)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, therefor, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this eighteenth day of March, in the year nineteen hundred and ten, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said land and property are situated in Granville in said County of Hampden, and are described as follows:-

Tract #1. Commencing at a stone monument on the southerly side of the Id Mountain road at the northwesterly corner of land of said Town of Westfield, formerly of William J. Leahey, thence South 13°36' East about two hundred seventy-four and eight tenths (274.8) feet to a stone monument, thence South 14°48' West about six hundred thirty-nine and four tenths (639.4) feet to a stone monument, thence South 66°47'30" East about one hundred seventy-nine (179) feet to a stone monument, thence South 36°22'30" West about thirteen hundred and three (1303) feet to a stone monument, the four preceeding courses are along land of the Town of Westfield, thence North 89°09'30" West along land formerly of Betsy Phelps about six hundred seven and eight tenths (607.8) feet to a stone monument at land of the Heirs of Silas Noble, thence North 10°27'15" East about two hundred fourteen and four tenths (214.4) feet to a stone monument, thence North 59°31' East about three hundred thirty-eight and three tenths (338.3) feet to a stone monument, thence South 71°52'15" East about one hundred fourteen and four tenths (114.4) feet to a stone monument, thence North 43°20'15" East about one hundred thirty-nine and nine tenths (139.9) feet to a stone monument, thence North 22°26'30" West about seventy-two and six tenths (72.6) feet to a stone monument, thence North 54°41'45" West about two hundred sixty-seven and one tenth (267.1) feet to a stone monument, thence North 16°38'15" West about two hundred thirty and three tenths (230.3) feet to a stone monument, thence North 79°38'15" West about seventy-four (74) feet to a stone monument, thence South 65°02'15" West about one hundred fifty-nine and three tenths (159.3) feet to a stone monument, thence South 33°36'15" West about one hundred ninety-seven and two tenths (197.2) feet to a stone monument, thence North 75°54'15" West about six hundred three and nine tenths (603.9) feet to a stone monument on the easterly side of the Old Granville road, the eleven preceeding courses are along land of the Heirs of Silas Noble, thence northerly along said road about eight hundred fifty-two (852) feet to land supposed to belong to W. O. Holcomb, thence easterly and northerly along land supposed to belong to said W. O. Holcomb to the Id Mountain road, so called, thence easterly along said road about fourteen hundred ninety (1490) feet to the place of beginning, containing about fifty-five and four tenths (55.4) acres. The foregoing described tract is supposed to belong to Elizabeth A. Holcomb of said Granville.

Tract #2. Commencing at a stone monument on the easterly side of the Old Granville road at the southwesterly corner of land of Peter Henrickson, thence South 74°55'30" East about fifty-six and nine tenths (56.9) feet to a stone monument, thence North 24°18' East about one hundred nine and nine tenths (109.9) feet to a stone monument on the southerly side of the Id Mountain road, the two preceeding courses are along land of said Henrickson, thence easterly along the Id Mountain road about two hundred fifty (250) feet to land supposed to belong to Elizabeth A. Holcomb, thence southerly and westerly along said land to the Old Granville road, thence northerly along the Old Granville road about two hundred (200) feet to the place of beginning, containing about three and fifty-five one-hundredths (3.55) acres.

The foregoing described tract is supposed to belong to W. O. Holcomb of said Granville.

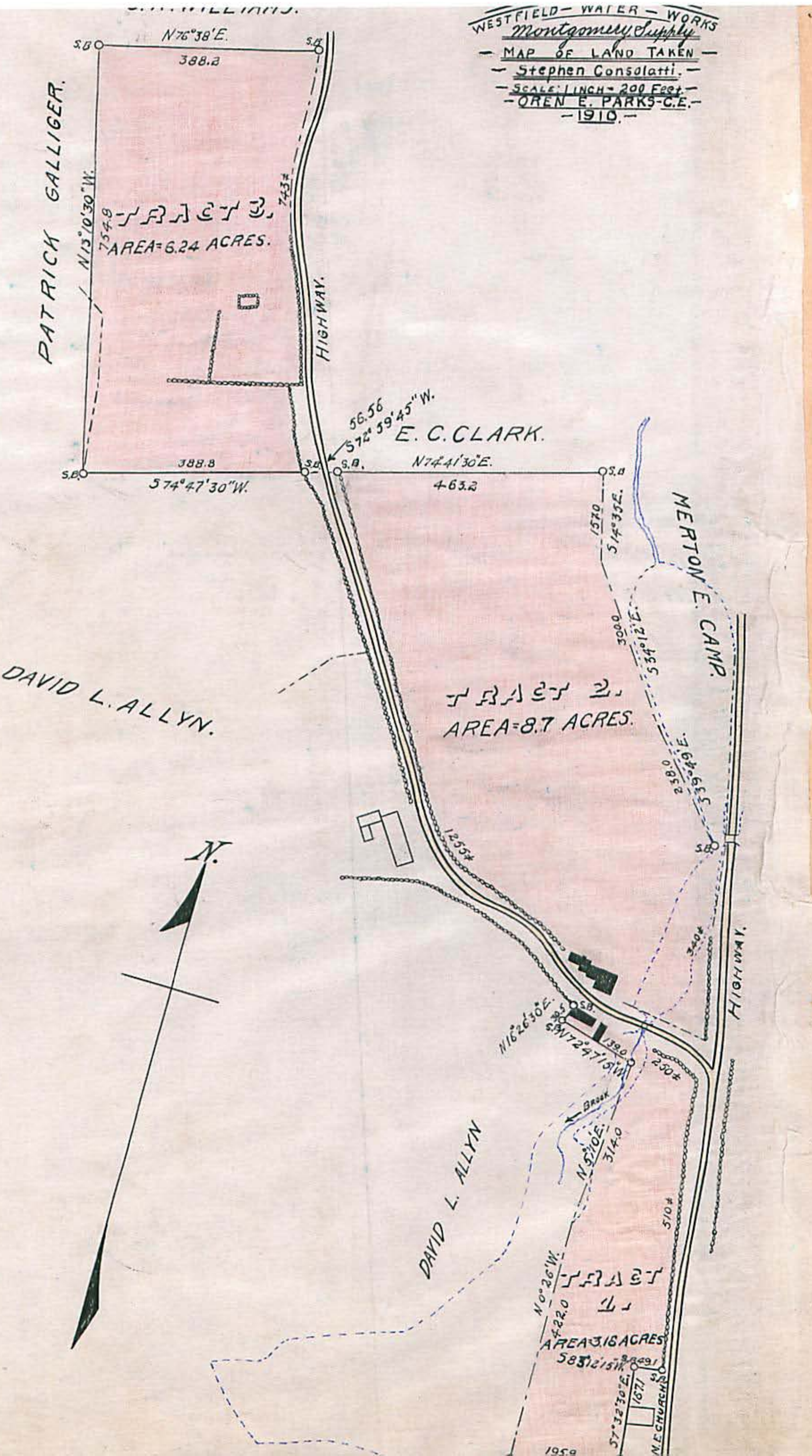
In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of Water Commissioners.
(S. A. Allen
(Thos Little
(S. W. Hildreth.

In the presence of Owen E. Parks

3196

HAMPDEN COUNTY REGISTRY OF DEEDS.
APR 4 1910
Received 3 H 12 M P.M.



WESTFIELD — WATER — WORKS

Montgomery Supply

— MAP OF LAND TAKEN —

— Stephen Consolatti. —

— SCALE: 1 INCH = 200 Feet. —

— OREN E. PARKS - C.E. —

— 1910. —

(Stephen Consolatti)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now , therefor, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this twenty-fifth day of March, in the year nineteen hundred and ten , taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which,in anywise, thereto appertain or belong.

Said land and property are situated in Montgomery in said County of Hampden, and are described as follows:-

Tract #1. Commencing at a stone monument on the westerly side of the highway at the northeasterly corner of the M. E. Church Lot, thence South 83°12'15" West about forty-nine and one tenth (49.1) feet to a stone monument, thence South 7°32'30" East about one hundred sixty-seven and one tenth (167.1) feet to a stone monument at land of David L. Allyn, the two preceeding courses are along said M. E. Church Lot, thence South 75°20'30" West about one hundred ninety-five and nine tenths (195.9) feet, thence North 0°26' West about four hundred twenty-two (422) feet, thence North 5°10' East about three hundred fourteen (314) feet, thence North 72°47'15" West about one hundred thirty-nine (139) feet to a stone monument, thence North 16°26'30" East about thirty and five tenths (30.5) feet to a stone monument on the southerly side of the highway, the last five courses are along land of said David L. Allyn, thence easterly about two hundred fifty (250) feet to the first mentioned highway, thence southerly along said highway about five hundred ten (510) feet to the place of beginning, containing about three and sixteen one-hundredths (3.16) acres.

Tract #2. Commencing at a stone monument on the westerly side of the highway near the bridge, thence southerly along the highway about three hundred forty (340) feet to the junction with a highway leading to the west, thence westerly and northerly along said highway about twelve hundred fifty-five (1255) feet to a stone monument at land of E. C. Clark, thence North 74°41'30" East along land of said Clark about four hundred sixty-three and two tenths (463.2) feet to a stone monument at land of Merton E. Camp, thence South 14°35' East about one hundred fifty-seven (157) feet, thence South 34°12' East about three hundred (300) feet, thence South 39°49' East about two hundred thirty-eight (238) feet to the place of beginning, the last three courses are along land of said Camp, containing about eight and seven tenths (8.7) acres.

Tract #3. Commencing at a stone monument on the westerly side of the highway, bearing South 72°59'45" West about fifty-six and fifty-six one-hundredths (56.56) feet from the stone monument at the northwesterly corner of Tract #2, thence South 74°47'30" West along land of David L. Allyn about three hundred eighty-eight and eight tenths (388.8)feet to a stone monument at land supposed to belong to Patrick Galliger, thence North 13°10'30" West along land of said Galliger about seven hundred fifty-four and eight tenths (754.8) feet to a stone monument at land of C. A. Williams, thence North 76°38' East along land of said Williams about three hundred eighty-eight and two tenths (388.2) feet to a stone monument on the westerly side of the highway, thence southerly along the highway about seven hundred forty-three (743) feet to the place of beginning, containing about six and twenty-four one-hundredths (6.24) acres.

The forefoing described tracts are supposed to belong to Stephen Consolatti of said Montgomery.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

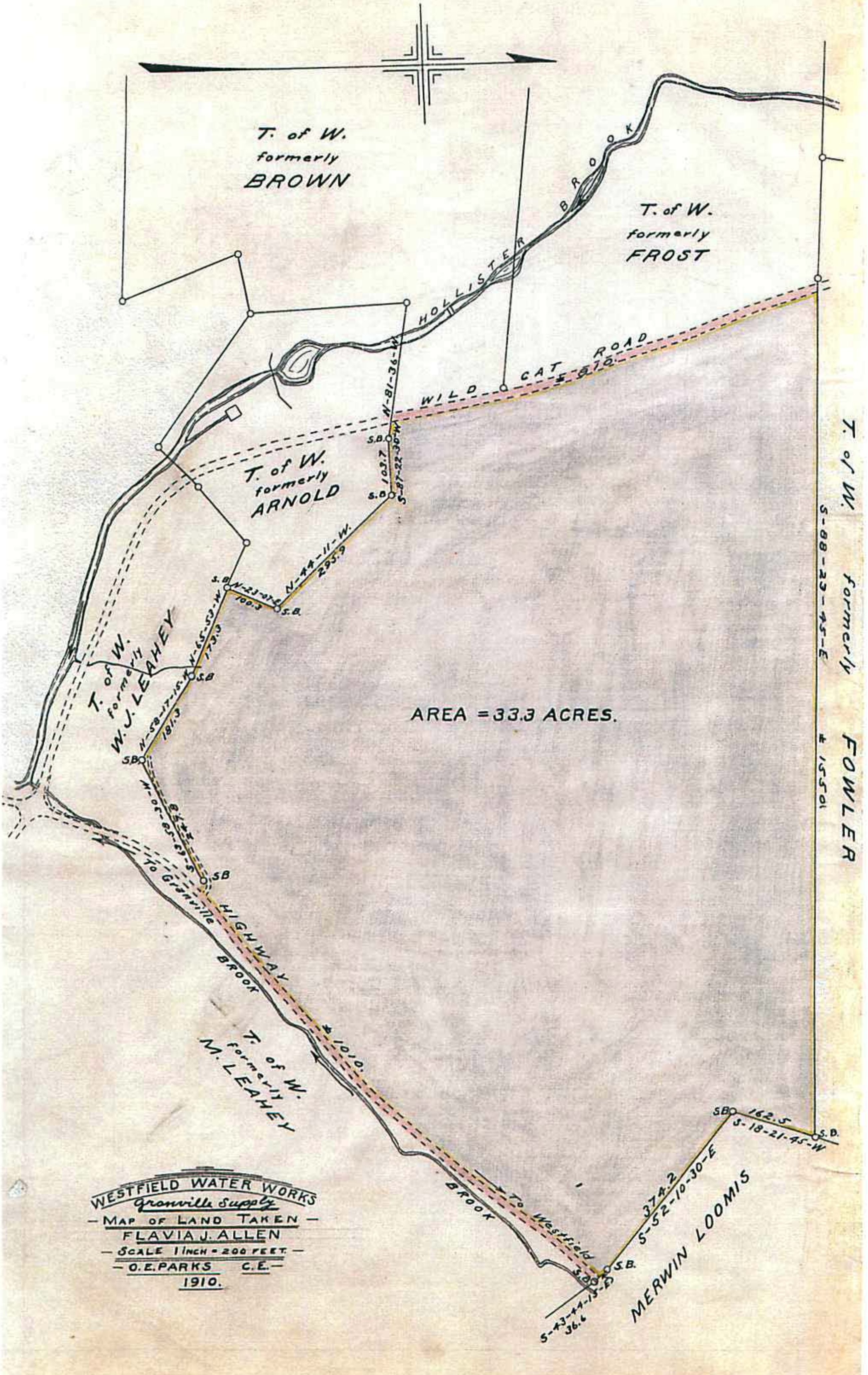
Board of Water Commissioners.

S. A. Allen
S. H. Hildreth
Thos Little

In the presence of Geo R. Keife

3197

HAMPDEN COUNTY REGISTRY OF DEEDS.
APR 4 1910
Received 3 H 12 M P.M.



WESTFIELD WATER WORKS
Granville Supply
— MAP OF LAND TAKEN —
FLAVIA J. ALLEN
— SCALE 1 INCH = 200 FEET. —
— O. E. PARKS C. E. —
1910.

(Flavia J. Allen)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, Therefore, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this first day of December in the year nineteen hundred and ten, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said land and property are situated in Granville in said County of Hampden, and are described as follows:-

Commencing at a stone monument on the westerly side of the highway leading from Westfield to Granville and at the northeasterly corner of land of said Inhabitants, formerly of W. J. Leahey, as shown on plan filed in Hampden County Registry of Deeds Aug. 8, 1906, thence S.63°58'30"W. two hundred forty-seven and eight tenths (247.8) feet to a stone monument, thence N.58°17'15"W. one hundred eighty-one and three tenths (181.3) feet to a stone monument, thence N.65°53'W. one hundred seventy-three and three tenths (173.3) feet to a stone monument at land formerly of one Arnold, now of said Inhabitants, the last three courses are along land formerly of said Leahey now of said Inhabitants, thence N.23°07'E. one hundred and three tenths (100.3) feet to a stone monument, thence N.44°11'W. two hundred ninety-five and nine tenths (295.9) feet to a stone monument, thence S.87°22'30"W. one hundred three and seven tenths (103.7) feet to a stone monument, thence N.81°36'W. to the Wild-Cat Road, so called, the last four courses are along land formerly of one Arnold now of said Inhabitants, thence northerly along the road about eight hundred ten (810) feet to land formerly of one Fowler now of said Inhabitants, thence S.88°23'45"E. along said land about fifteen hundred fifty (1550) feet to a stone monument at land supposed to belong to Merwin Loomis, thence S. 18°21'45"W. one hundred sixty-two and five tenths (162.5) feet to a stone monument, thence S.52°10'30"E. three hundred seventy-four and two tenths (374.2) feet to a stone monument on the westerly side of the highway leading from Westfield to Granville, the last two courses are along land of said Loomis, thence southwesterly along the highway about ten hundred ten (1010) feet to the place of beginning, containing about thirty-three and three tenths (33.3) acres. The foregoing described tract is supposed to belong to Flavia J. Allen of Westfield, Mass.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of Water Commissioners.

D. A. Allen

Thos. Little

L. W. Hildreth

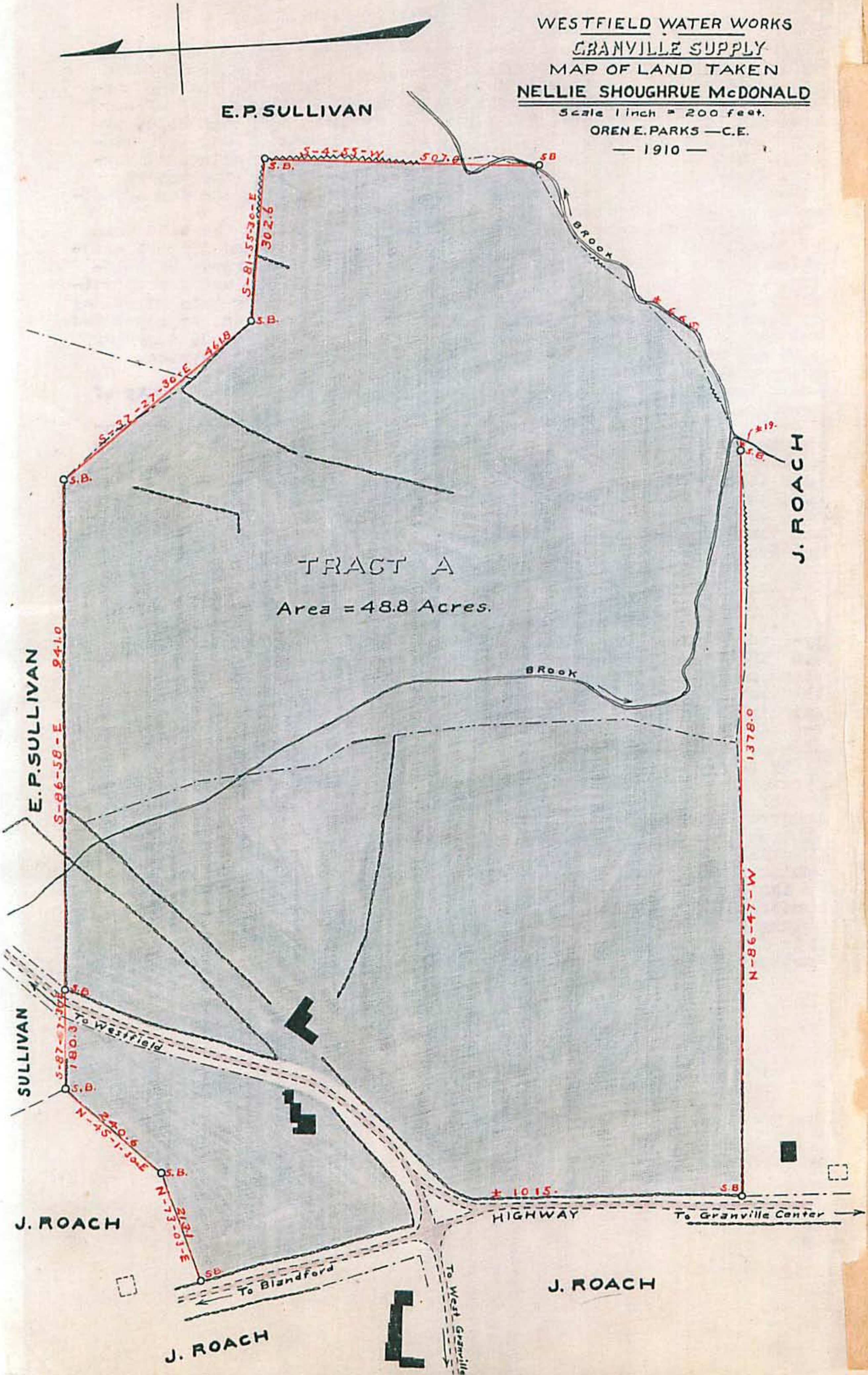
In the presence of Orrin E. Parks

446

HAMPDEN COUNTY REGISTRY OF DEEDS.

JAN 12 1911

Received 2 H 30 M Pm



WESTFIELD WATER WORKS
GRANVILLE SUPPLY
MAP OF LAND TAKEN
NELLIE SHOUGHRUE McDONALD
Scale 1 inch = 200 feet.
OREN E. PARKS — C.E.
— 1910 —

(Nellie Shoughrue McDonald)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, Therefore, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this first day of December in the year nineteen hundred and ten, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:- Tract "A",

Commencing at a stone monument on the easterly side of highway leading from West Granville to Westfield and in the southerly line of land of E. P. Sullivan, thence S. 86°58'E. nine hundred forty-one (941.0) feet to a stone monument, thence S.37°27'30"E. four hundred sixty-one and eight tenths (461.8) feet to a stone monument, thence S.81°55'30" E. three hundred two and six tenths (302.6) feet to a stone monument, thence S.4°55'W. five hundred seven (507.0) feet to a stone monument on the easterly side of a brook at land supposed to belong to John Roach, the last four courses are along land of E. P. Sullivan, thence southwesterly up the brook about six hundred sixty-five (665) feet to a point, thence N.86°47'W. about nineteen (19) feet to a stone monument, thence same course thirteen hundred seventy-eight (1378.0) feet to a stone monument in the easterly line of the highway leading to Granville Center, the last three courses are along land of John Roach, thence northerly along the highway, crossing the road leading from West Granville to Westfield, about ten hundred fifteen (1015) feet to a stone monument at land of John Roach, thence N.73°03'E. two hundred thirteen and one tenth (213.1) feet to a stone monument, thence N.45° 01'30"E. two hundred forty and six tenths (240.6) feet to a stone monument at land of E. P. Sullivan, the last two courses are along land of said Roach, thence S. 87°07'30"E. crossing the highway leading from West Granville to Westfield, one hundred eighty and three tenths (180.3) feet to the place of beginning, containing about forty-eight and eight tenths (48.8) acres, exclusive of area of West Granville and Westfield Highway within said described tract.

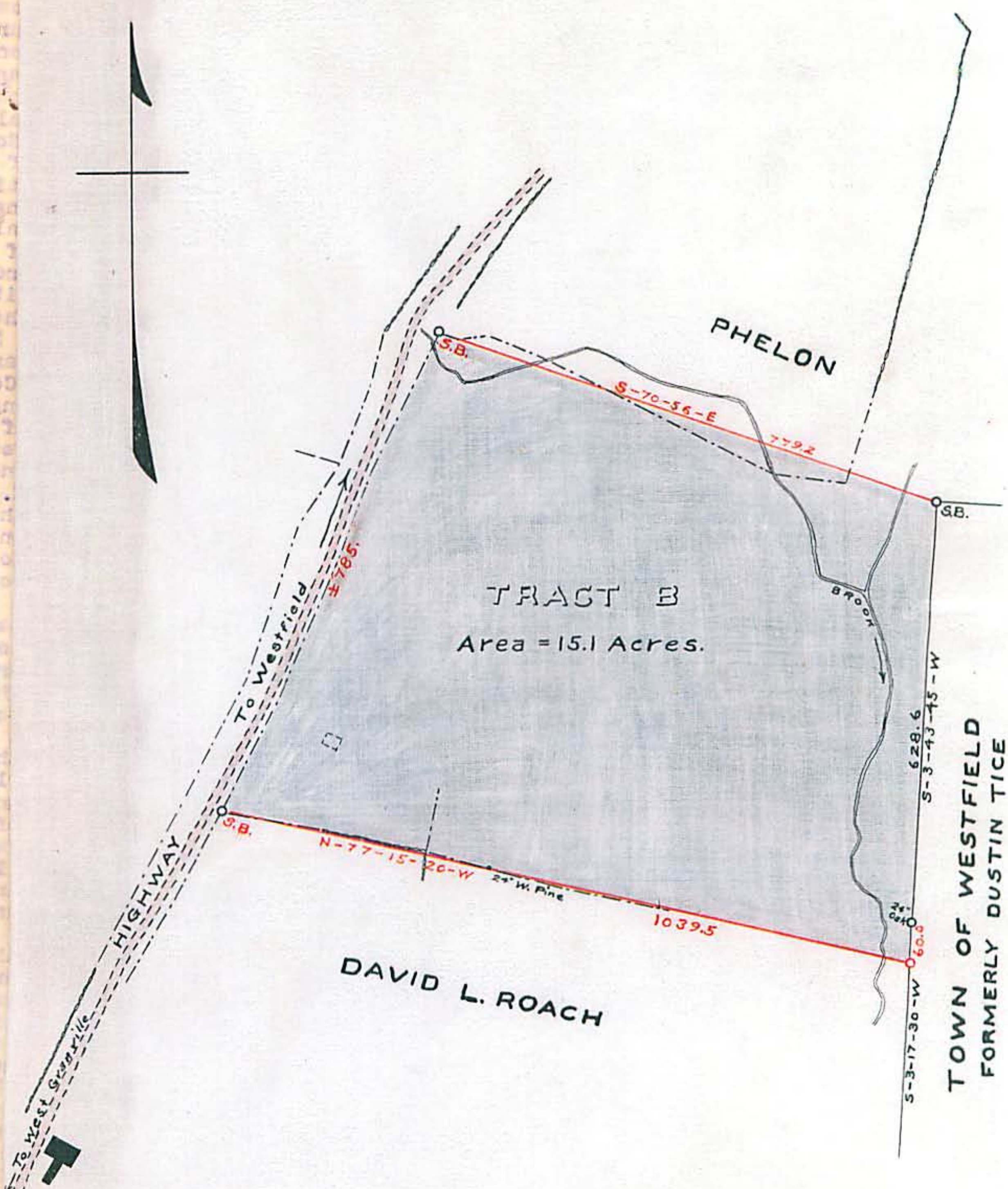
Tract "B". Commencing at a stone monument on the easterly side of the highway leading from West Granville to Westfield and in the northerly line of land of David L. Roach, thence northerly along said highway about seven hundred eighty-five (785) feet to a stone monument at land supposed to belong to one Phelon, thence S.70°56'E. along said land seven hundred seventy-nine and two tenths (779.2) feet to a stone monument at land of the Town of Westfield, formerly of Dustin Tice, thence S.3°43'45"W. along said land six hundred twenty-eight and six tenths (628.6) feet to an Oak Tree, thence South 3°17'30"W. sixty (60.0) feet to land of David L. Roach, thence N. 77°15'20"W. along said land ten hundred thirty-nine and five tenths (1039.5) feet to the place of beginning, containing fifteen and one tenth (15.1) acres.

The foregoing described tracts formerly were supposed to belong to Nellie Shoughrue McDonald and the record title is now in the said Town of Westfield.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of
Water Commissioners.- S. A. Allen
L. N. Hildreth
Thos. Little

In the presence of Geo. P. Seife



WESTFIELD WATER WORKS
GRANVILLE SUPPLY
MAP OF LAND TAKEN
NELLIE SHOUGHRUE McDONALD
Scale 1 inch = 200 feet.
OREN E. PARKS — C.E.
— 1910 —

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, Therefore, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this ninth day of March in the year nineteen hundred and twelve, taken, appropriated and now holds the land and property hereinafter described together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

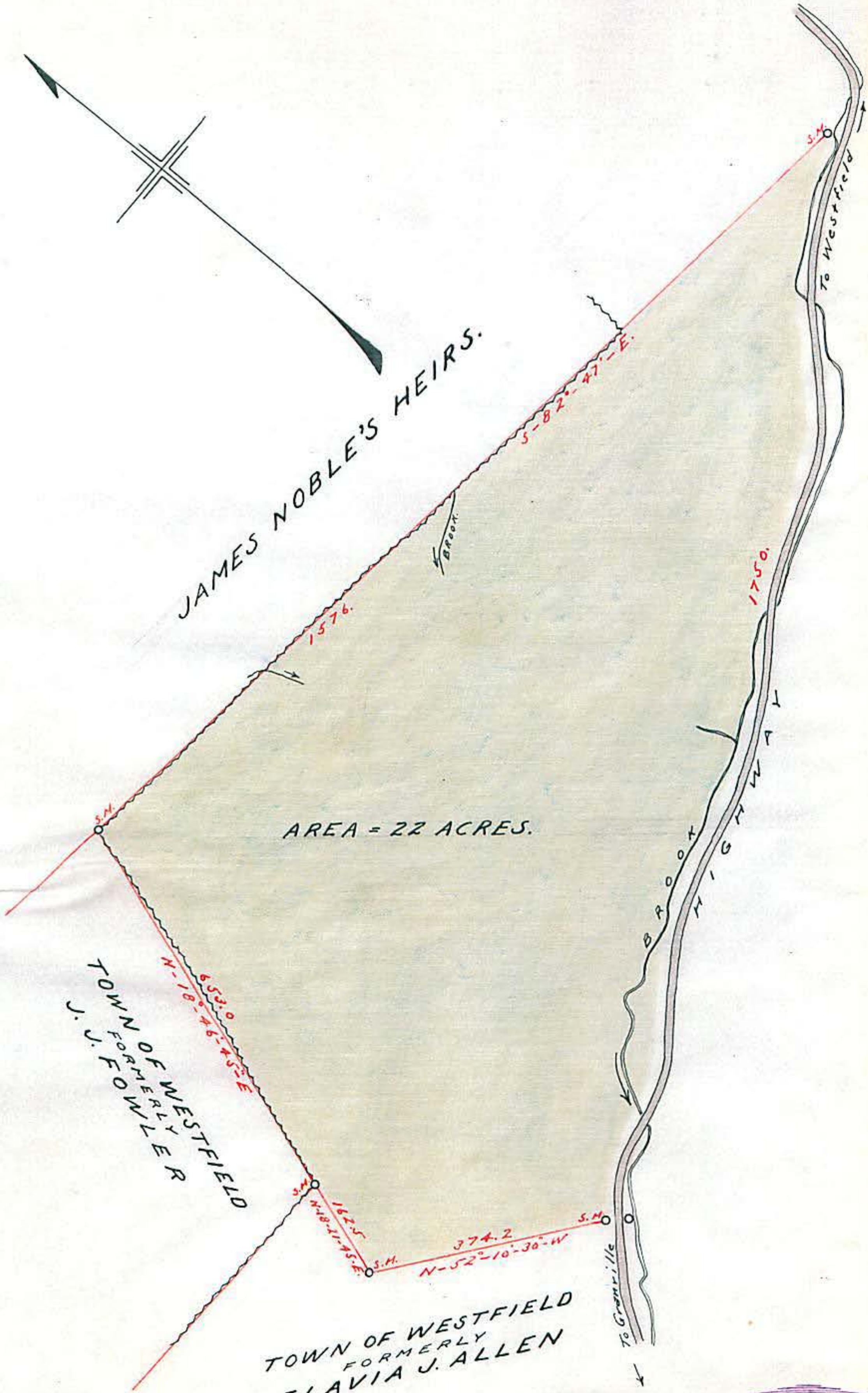
Commencing at a stone monument on the westerly side of the highway leading from Westfield to Granville at land of Town of Westfield, formerly of Flavia J. Allen, thence N. 52°10'30" W. about three hundred seventy-four and two tenths (374.2) feet to a stone monument; thence N. 18° 21'45" E. about one hundred sixty-two and five tenths (162.5) feet to a stone monument at land of Town of Westfield, formerly of J.J. Fowler, the last two courses being along land formerly of Allen, thence N. 18°46'45" E. along land formerly of J.J. Fowler about six hundred fifty-three (653) feet to a stone monument at land of heirs of James Noble; thence S.82°47' E. along land of said heirs about fifteen hundred seventy-six (1576) feet to a stone monument on the westerly side of said highway leading from Westfield to Granville; thence southwesterly along said highway about seventeen hundred fifty (1750) feet to the place of beginning, containing about twenty-two (22) Acres. The foregoing described tract formerly was supposed to belong to Andelusia Noble et. als. and the record title is now in the Town of Westfield.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of
Water Commissioners.

S. A. Allen
Jas. S. Downey

In the presence of Geo. P. Kiefe



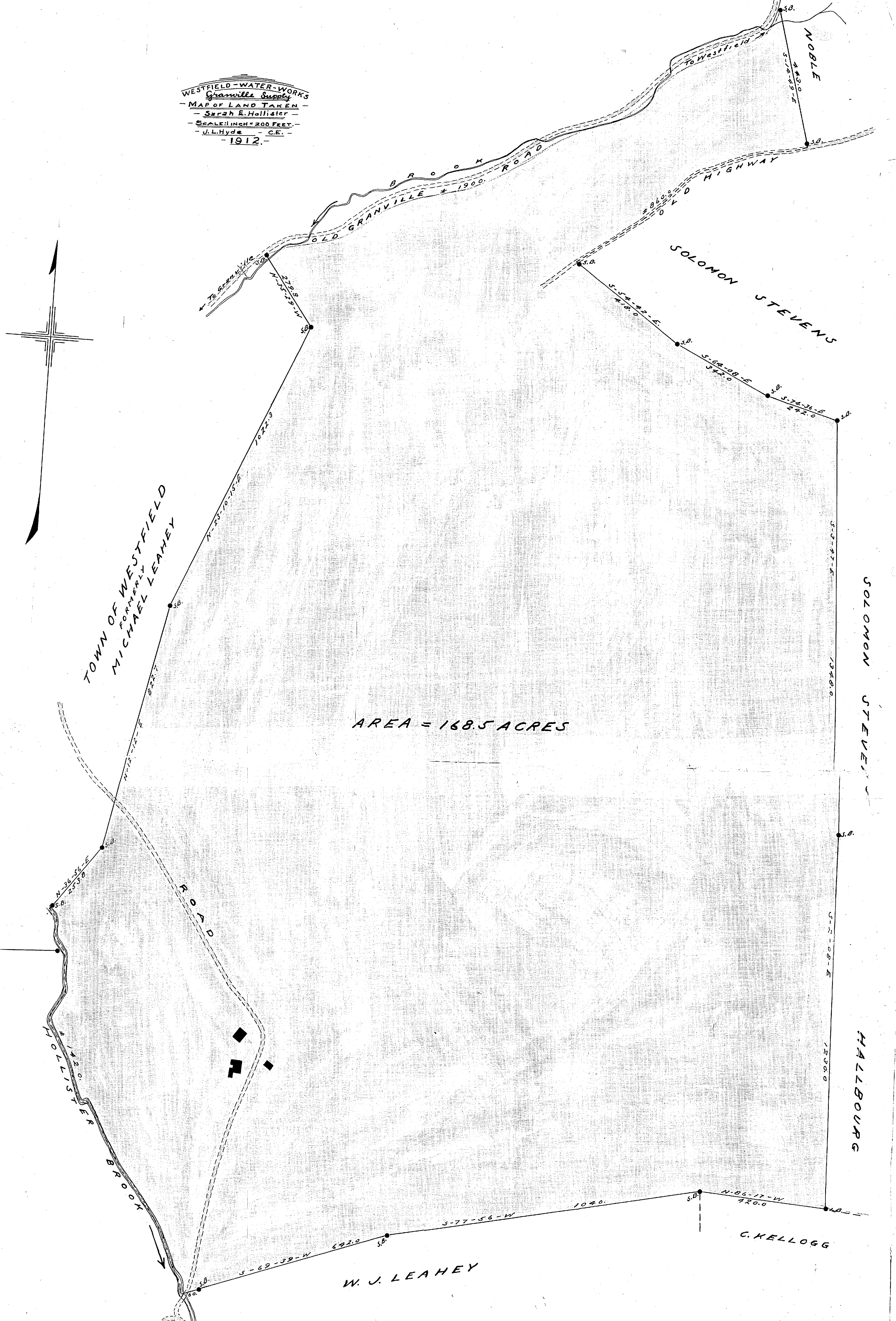
WESTFIELD WATER WORKS
- Granville Supply -
- MAP OF LAND TAKEN -
— ANDELUSIA NOBLE et. als. —
— SCALE: 1 INCH = 200 FEET. —
— JOHN L. HYDE — C. E. —
— 1912. —

WESTFIELD-WATER-WORKS
Granville Supply
MAP OF LAND TAKEN
Sarah E. Hollister

SCALE: 1 INCH = 200 FEET.

J. L. Hyde - C.E.

1912.



Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectualy carrying out the objects of said Act:-

Now, Therefore, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this first day of February in the year nineteen hundred and twelve, taken, appropriated and now holds the land and property hereinafter described, together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

Commencing at a stone bound on the southerly side of the Old Granville Road at land of Town of Westfield, formerly of Michael Leahey; thence northeasterly along said highway about nineteen hundred (1900) feet to a stone monument at land of Noble; thence S.14°49'E. about four hundred forty-three (443) feet along land of said Noble to a stone monument at land of Solomon Stevens; thence same course fifteen (15) feet to the center of old highway; thence southwesterly along center of said highway about eight hundred sixty (860) feet; thence S.54°42'E. about ten (10) feet to a stone monument; thence same course about four hundred eighteen (418) feet to a stone monument; thence S.64°08'E. about three hundred forty two (342) feet to a stone monument; thence S.74°36'E. about two hundred forty two (242) feet to a stone monument; thence S. 3°47'E. about thirteen hundred forty-eight (1348) feet to a stone monument, the last five courses being along land of said Solomon Stevens; thence S.2°8'E. about twelve hundred thirty (1230) feet along land of said Stevens and land of Hallbourg toan iron monument at land of Clifford Kellogg; thence N.86°17'W. about four hundred twenty (420) feet to a stone monument at land of W. J. Leahey, the last course being along land of said Clifford Kellogg; thence S.77°56'W. about ten hundred forty (1040) feet to a stone monument; thence S.69°39'W. about six hundred forty-two (642) feet to a stone monument; thence same course about sixty (60) feet to the center of Hollister brook; thence northerly along said brook about fourteen hundred ~~hundred~~ twenty (1420) feet to land of Town of Westfield, formerly of Michael Leahey; thence N.36°56'E. about twenty (20) feet to a stone monument; thence same course about two hundred fifty-three and eight tenths (253.8) feet to a stone monument; thence N.12°12'E. about eight hundred twenty- two and seven tenths (822.7) feet to a stone monument; thence N.23°10'15"E. about ten hundred twenty-two and three tenths (1022.3) feet to a stone monument; thence N.35°29'W.about two hundredseventy-nine and eight tenths (279.8) feet to the place of beginning, the last four courses being along land of along land of Town of Westfield, formerly of Michael Leahey. The above described tract containing about one hundred sixty-eight and five tenths (168.5) acres. The foregoing described tract is supposed to belong to Sarah E. Hollister of Hartford,Connecticut.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of (S. A. Allen
Water Commissioners (Thos Little
(S. W. Hildreth.

In the presence of Geo. P. [illegible]

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized. for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, Therefore, Know all Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has on this ninth day of March in the year nineteen hundred and twelve, taken appropriatedand now holds the land and property hereinafter described together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

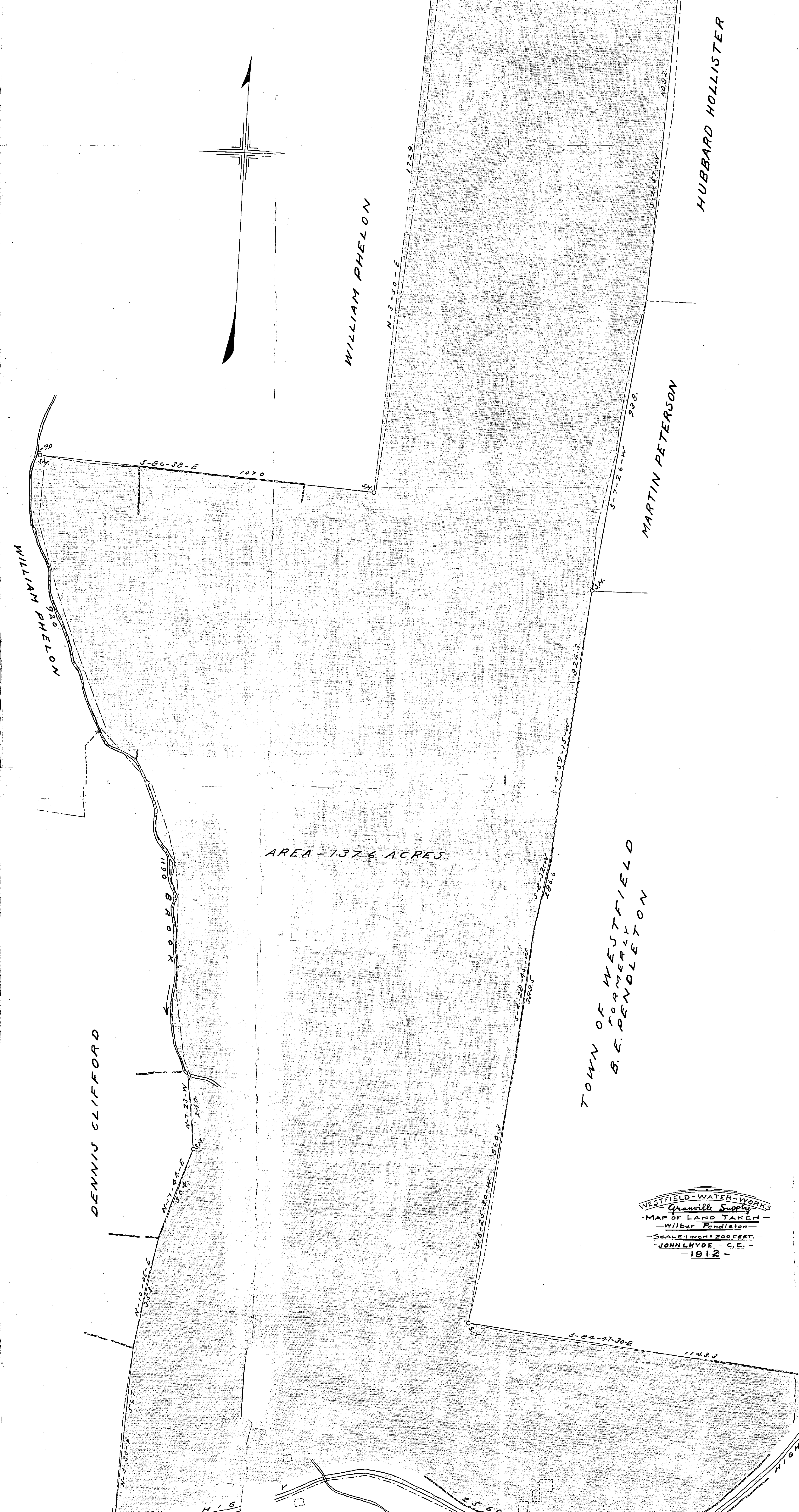
Said land and property are situated in Granville in said County of Hampden and are described as follows:-

Commencing at a stone monument on the northerly side of the highway at land of Dennis Clifford; thence N. 3°30' E. about five hundred sixty-seven (567) feet; thence N. 10°5' E. about three hundred fifty-three (353) feet; thence N. 17°44' E. about three hundred four (304) feet to a stone monument; thence N. 7°23' W. about two hundred forty (240) feet to the center of the brook; thence northerly along said brook about eleven hundred ninety (1190) feet to land of William Phelon, the last five courses being along land of Dennis Clifford; thence northerly along said brook about nine hundred twenty (920) feet; thence S. 86°38' E. about nine (9) feet to a stone monument; thence same course about ten hundred seventy (1070) feet to a stone monument; thence N. 3°30' E. about seventeen hundred twenty-nine (1729) feet to a stone monument at land of Jerry Sullivan, the last three courses being along land of said Phelon; thence N. 85°45' E. along land of said Sullivan about four hundred twenty-five (425) feet to a stone monument at land of Town of Westfield, formerly of Michael Arnold; thence S. 86°38'30" E. along said land, about three hundred fifty-three and three tenths (353.3) feet to a stone monument at land of Hubbard Hollister; thence S. 2°57' W. along land of said Hollister about ten hundred eighty-two (1082) feet to land of Martin Peterson; thence S. 7°26' W. along land of said Peterson about nine hundred thirty-eight (938) feet to a stone monument at land of Town of Westfield, formerly of B. E. Pendleton; thence S. 4°59'15" W. about eight hundred twenty-four and three tenths (824.3) feet; thence S. 8°32' W. about two hundred eighty-six and six tenths (286.6) feet; thence S. 4°28'45" W. about three hundred eighty-eight and five tenths (388.5) feet; thence S. 6°25'30" W. about eight hundredsixty and three tenths (860.3) feet to a stone monument; thence S. 84°47'30" E. about eleven hundred forty-three and three tenths (1143.3) feet to a stone monument on the northerly side of the said highway, the last five courses being along land of Town of Westfield; thence westerly along said highway about twenty-five hundred sixty (2560) feet to the place of beginning, containing about one hundredthirty-seven and six tenths (137.6) Acres. The foregoing described tract formerly was supposed to belong to Wilbur Pendleton and the record title is now in the Town of Westfield.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of (S. A. Allen
Water Commissioners. (Jas. S. Downie

In the presence of Geo. P. Keife



WESTFIELD-WATER-WORKS
-Granville Supply-
-MAP OF LAND TAKEN-
-Wilbur Pendleton-
-SCALE: 1 INCH = 200 FEET.-
-JOHN L. HYDE - C.E.-
-1912-

(Mary J. Phelan.)

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

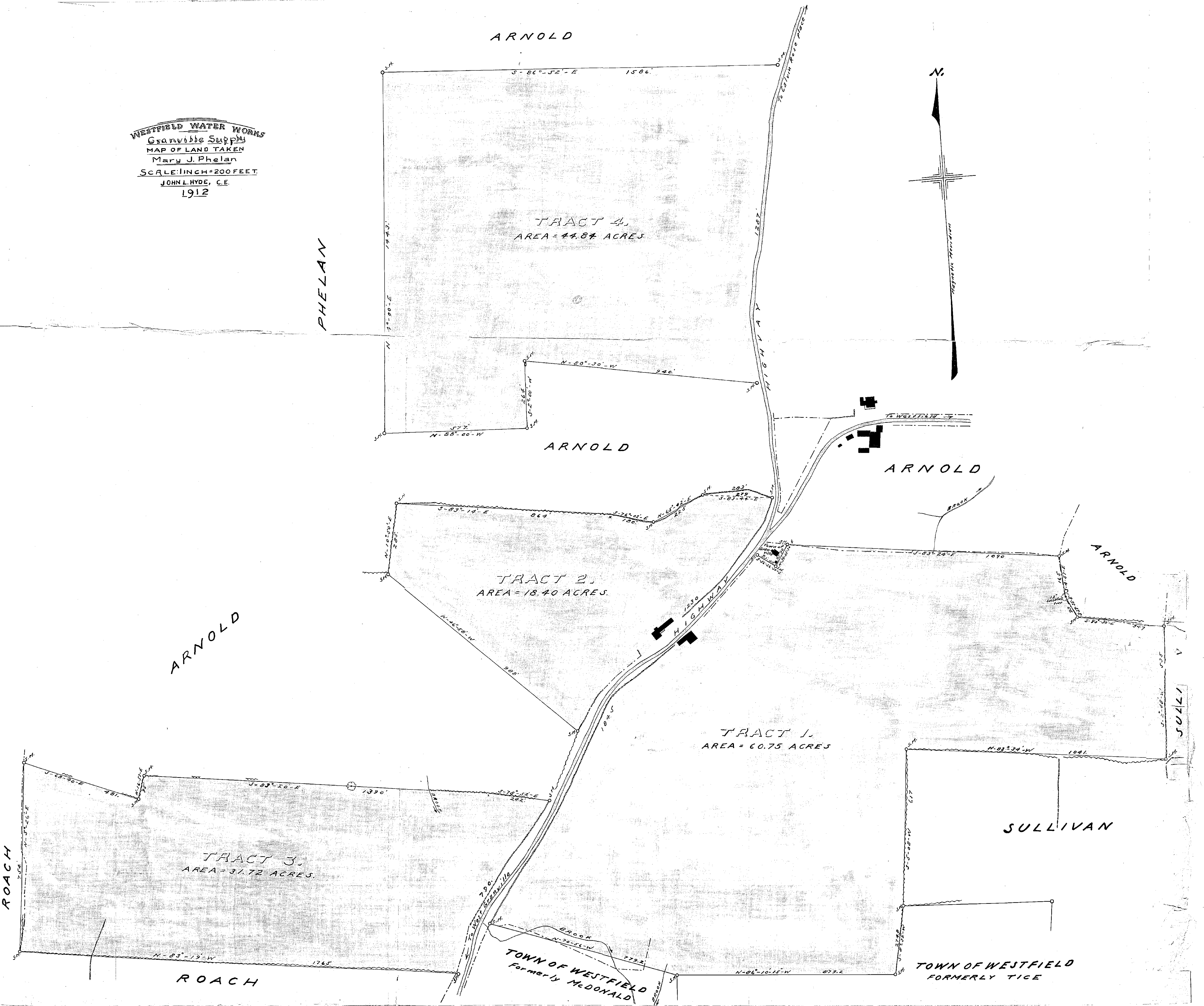
Now, Therefore, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this fourth day of November in the year nineteen hundred and twelve, taken, appropriated and now holds the land and property hereinafter described together with any and all rights of way and easements which, in anywise, thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

Tract #1. Commencing at a stone monument on the easterly side of the highway leading from Westfield to West Granville at the southwest corner of the school house lot of the Town of Granville, thence South 56°22'30" East about eighty-five (85.0) feet to a stone monument, thence North 34°25'30" East about ninety-five and nine tenths (95.9) feet to a stone monument at land of Michael Arnold, the preceeding courses are along land of the Town of Granville, thence South 83°24' East about one thousand ninety (1090.0) feet to a stone monument, thence South 4°57' East about one hundred sixty-five (165.0) feet to a marked twelve (12) inch sassafras tree, thence South 27°55' East about ninety-three (93.0) feet to a stone monument, thence South 80°30' East about three hundred forty-seven (347.0) feet to a stone monument at land of one Sullivan, the last four courses are along land of said Arnold, thence South 2°48' West about five hundred thirty-five (535.0) feet to a stone monument, thence North 83°34' West about one thousand and forty-one (1041.0) feet to a stone monument, thence South 5°08' West about six hundred seventeen (617.0) feet to a stone monument at land of Town of Westfield, formerly of Tice, the last three courses are along land of said Sullivan, thence South8°32' West about two hundred seventy-four and eight tenths (274.8) feet to a stone monument, thence North 86°10'15" West about eight hundred seventy-nine and two tenths (879.2) feet to a stone monument at land of Town of Westfield, formerly of McDonald, thence North 70°56' West about seven hundred seventy-nine and two tenths (779.2) feet to a stone monument on the easterly side of said highway, the last three courses are along land of Town of Westfield, thence northeasterly along said highway about eighteen hundred forty-five (1845.0) feet to the place of beginning, containing about sixty and seventy-five one hundredths (60.75) Acres.

Tract #2. Commencing at a stone monument on the westerly side of the highway opposite Tract #1 at the southerly corner of the tract described and at land of said Arnold, thence North 46° 58' West about nine hundred eighty-eight (988.0) feet to a stone monument, thence North 10°50' East about two hundred eighty-five (285.0) feet to a stone monument, thence South 83°14' East about eight hundred sixty-four (864.0) feet, thence South 76°02' East about one hundred eighty (180.0) feet to a stone monument, thence North 65°42' East about two hundred twenty-five (225.0) feet to a stone monument, thence easterly along wall about two hundred eighty-three (283.0) feet to a stone monument on the westerly side of the road leading to the Calvin Rose place, said monument bearing South 83°44' East about two hundred seventy-nine (279.0) feet

WESTFIELD WATER WORKS
Granville Supply
MAP OF LAND TAKEN
Mary J. Phelan
SCALE: 1 INCH = 200 FEET.
JOHN L. HYDE, C.E.
1912



rom last described monument, the preceeding courses are along and of said Arnold, thence southwesterly along the highway about welve hundred thirty (1230.) feet to the place of beginning, ontaining about eighteen and four tenths (18.4) Acres.

Tract #3. Commencing at a stone monument on the westerly ide of the highway opposite Tract 1. and south of Tract #2 at the ortheasterly corner of land of one Roach, thence North 83°19' est about seventeen hundred sixty-five (1765.0) feet to a stone onument, thence North 5°26' East about seven hundred fifty-four 754.0) feet to a stone monument at land of one Arnold, the last wo courses being along land of said Roach, thence South 68°40' East about four hundred eighty-one (481.0) feet to a stone monument, hence North 16°53' East about ninety-five (95.0) feet to a stone monument, thence South 83°20' East about thirteen hundred ninety (1390.0) feet, thence South 78°52' East about two hundred forty-wo (242.0) feet to a stone monument on the westerly side of the said highway, the last four courses being along land of said Arnold, thence Southwesterly along said highway about seven hundred ninety (790.0) feet to the place of beginning, said Tract containing about thirty-one and seventy-two one hundredths (31.72) Acres.

Tract #4. Commencing at a stone monument on the easterly side of the road leading to the Calvin Rose place in the northerly line of land of one Arnold, thence North 80°30' West about nine hundred forty (940.0) feet to a stone monument, thence South 2° West about two hundred sixty-four (264.0) feet to a stone monument, thence North 88° West about five hundred seventy-seven (577.0) feet to a stone monument at land of Phelan, the three courses being along land of said Arnold, thence North East along land of said Phelan about fourteen hundred forty-three (1443.0) feet to a stone monument at land of said Arnold, thence South 86°52' East along land of said Arnold about fifteen hundred eighty-six (1586.0) feet to a stone monument on the westerly side of the road leading to the said Calvin Rose place, thence southerly along said road about twelve hundred eighty-seven (1287.0) feet to the place of beginning, said Tract containing about forty-four and eighty-four one hundredths (44.84) Acres.

The foregoing described tracts are supposed to belong to Mary J. Phelan of Granville.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of

Water Commissioners

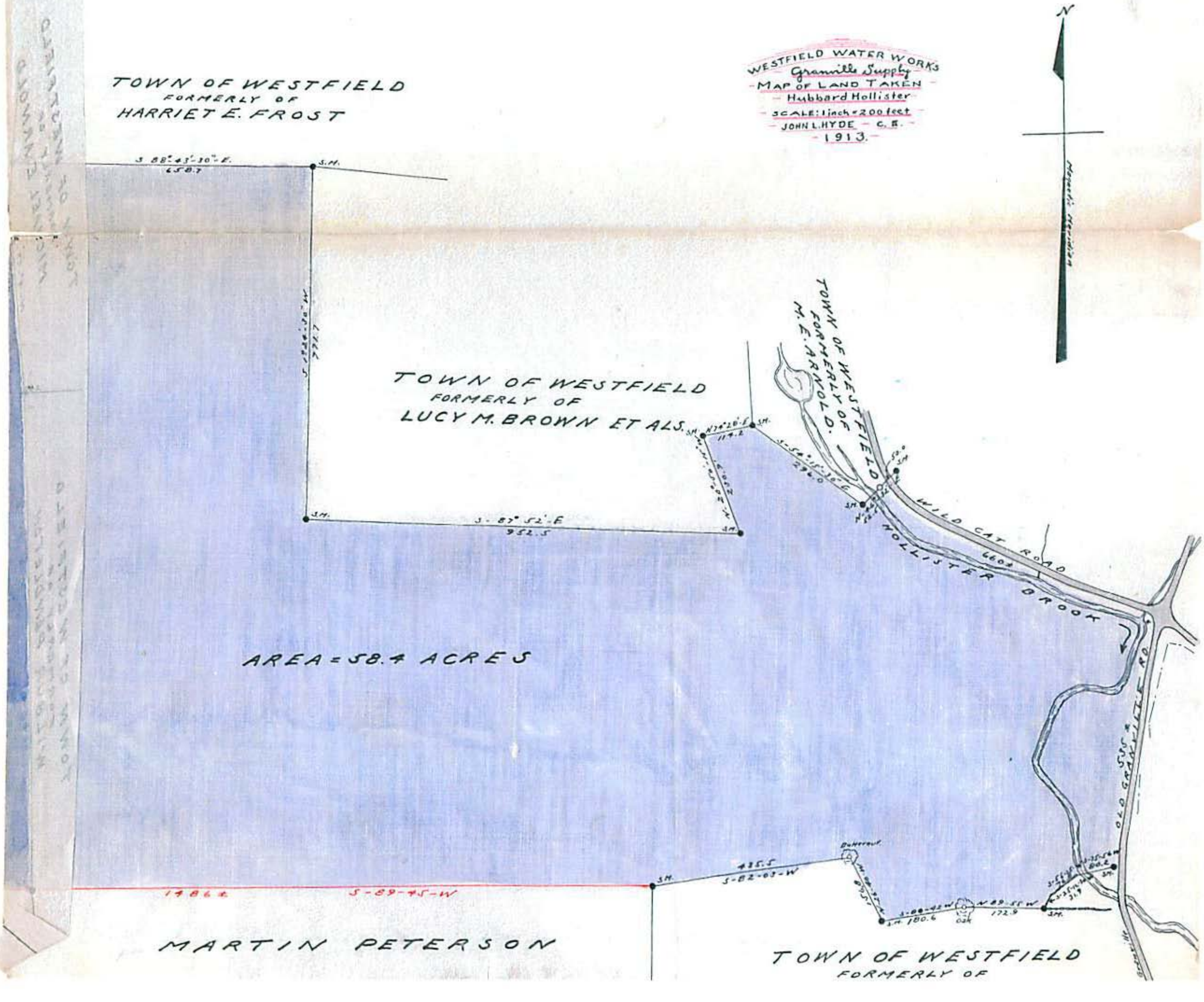
S. A. Allen

S. W. Hildreth

In the presence of

672

HAMPDEN CO REGISTRY OF DEEDS
RECEIVED AND RECORDED
JAN 15 1913
AT 2 OC – M P M



WESTFIELD WATER WORKS
Granville Supply
MAP OF LAND TAKEN
Hubbard Hollister
SCALE: 1 inch = 200 feet
JOHN L. HYDE C. E.
1913.

Hollister.

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts, in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters, taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, Therefore, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this eight day of October in the year of nineteen hundred and thirteen, taken, appropriated and now holds the land and property hereinafter described together with any and all rights of way and easements which, in anywise thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

Commencing at a stone monument on the westerly side of the old Granville Road, so called, at northeasterly corner of land of Town of Westfield, formerly of Michael Leahey, thence S. 75° 56' W. about eightyand two tenths(80.2) feet to the end of a wall on the west side of Hollister Brook, so called, thence S. 55°25' W. about seventy-six and eight tenths (76.8) feet, thence S. 25°12'30" W. about thirty-one and nine tenths (31.9) feet to a stone monument, thence N. 89° 55' W. about one hundred seventy-two and nine tenths (172.9) feet to a marked oak tree, thence S. 80°42' W. about one hundred eighty and six tenths(180.6) feet to a stone monument, thence N. 26° 40' W. about one hundred fifty-six and eight tenths (156.8) feet to a marked butternut tree, thence S. 82°03' W. about four hundred thirty-five and five tenths (435.5) feet to a stone monumentat land of Martin Peterson, the preceeding courses are along land of said Town of Westfield, thence S. 89°45' W. about fourteen hundred eighty-six (1486.0) feet along land of said Peterson, to a stone monument at land of Town of Westfield, formerly of Wilbur Pendleton, thence N.-2°57' E. about ten hundred eighty-two (1082.0) feet along land formerly of said Pendleton to a stone monument at land of Town of Westfield, formerly of Michael E. Arnold; thence N. 4°59' E. along land formerly of said Arnold about five hundred five and six tenths (505.6) feet to a stone monument at land of Town of Westfield, formerly of Harriett M. Frost; thence S. 88°43' 30" E. along land formerly of said Frost, about six hundred fifty-eight and seven tenths (658.7) feet to a stone monument at land of Town of Westfield, formerly of Lucy M. Brown et.als., thence S. 1°24'30" W. about seven hundred seventy-one and seven tenths (771.7) feet to a stone monument, thence S. 87°52' E. about nine hundred fifty-two and five tenths (952.5) feet to a stone monument, thence N-20°50'15" W. about two hundred thirty and nine tenths (230.9) feet to a stone monument, thence N. 74°28' E. about one hundred fourteen and two tenths (114.2) feet to a stone monument at land of Town of Westfield, formerly of Michael E. Arnold, the last four courses are along land formerly of Brown, et.als. thence S. 54°15'30" E. about two hundred ninety-six (296.0) feet to a stone monument, thence N. 46°32' E. about fifty-two and five tenths (52.5) feet to a point on the westerly ide of the Wild Cat road, the last two courses are along and formerly of said Arnold, thence southeasterly along aid road, about six hundred sixty (660.0) feet to a point n the westerly side of said old Granville road, thence outherly along said road about five hundred thirty-five 535.0) feet to the place of beginning, containing about ifty-eight and four tenths (58.4) Acres.

The foregoing described tracts are supposed to belong o Hubbard Hollister of Granville.

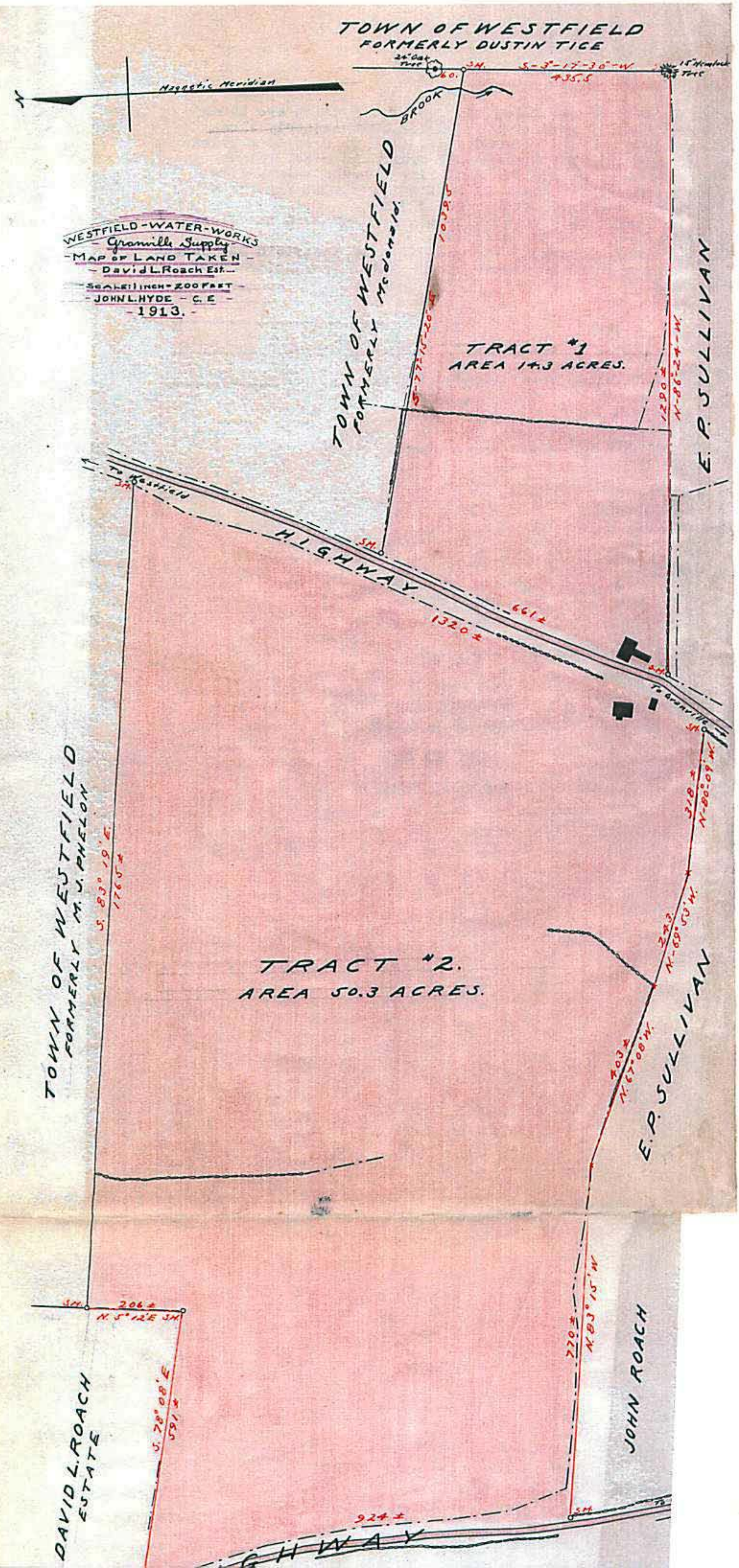
In Witness Whereof, the said Town of Westfield has caused his instrument to be signed by the Water Commissioners of aid Town.

(
(______________________
(
Board of (L. W. Hildreth.
(
Water Commissioners (Jas. S. Dawne

n the presence of ____________________

14161

HAMPDEN CO REGISTRY OF DEEDS
RECEIVED AND RECORDED
OCT 21 1913
AT 8 OC 30 M a M



WESTFIELD-WATER-WORKS
- Granville Supply -
- MAP OF LAND TAKEN -
- David L. Roach Est. -
- SCALE: 1 INCH = 200 FEET -
- JOHN L. HYDE - C. E -
- 1913. -

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, Therefore, Know All Men By These Presents, that the said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this first day of October in the year nineteen hundred and thirteen, taken, appropriated and now holds the land and property hereinafter described together with any and all rights of way and easements which, in anywise thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

Tract #1. Commencing at a stone monument on the easterly side of the highway leading from Westfield to West Granville at the southwesterly corner of land of the Town of Westfield, formerly of Nellie S. McDonald, thence S. 77°15'20" E. along land of said Town, about one thousand thirty-nine and five tenths (1039.5) feet to a stone monument, thence S. 3°17'30" W. along land of said Town, about four hundred thirty-five and five tenths (435.5) feet to a fifteen (15) inch hemlock at land of E. P. Sullivan, thence N. 86°24' W. along land of said Sullivan about twelve hundred ninety (1290.0) feet to a stone monument on the easterly side of said highway, thence northerly along said highway, aboutsix hundred sixty-one (661.0) feet to the place of beginning, containing about fourteen and three tenths (14.3) Acres.

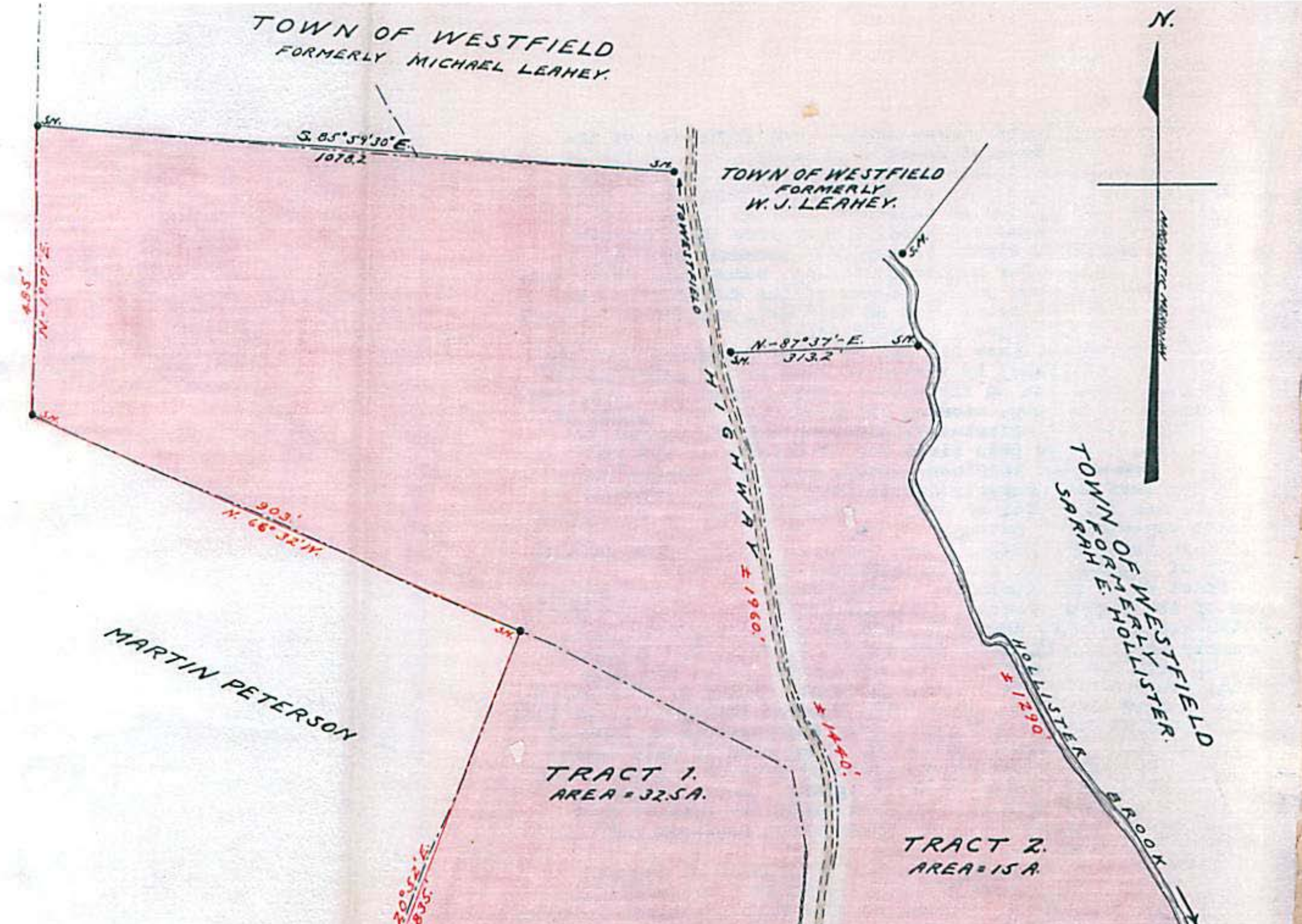
Tract #2. Commencing at a stone monument on the westerly side of said highway from Westfield to West Granville at the northeasterly corner of land of said E. P. Sullivan , thence N. 80°09' W. about three hundred eighteen (318.0) feet, thence N. 69°53' W. about two hundred forty-three (243.0) feet ,thence N. 67°08' W. about four hundred three (403.0) feet, thence N. 3°15' W. about seven hundred seventy (770.0) feet to a stone monument on the easterly side of the highway leading from Blandford to Granville, the preceding courses are along land of E. P. Sullivan, and land of John Roach, thence northerly along said Blandford road, about nine hundred twenty-four (924.0) feet to a stone monument, thence S. 78°08' E. about five hundred ninety-one (591.0) feet to a stone monument, thence N. 5°12' E. about two hundred six (206.0) feet to a stone monument at land of said Town, formerly of Mary J. Phelon, the last two courses are along land of Roach,Est,thence S. 83°19' E. along land of said Town about seventeen hundred sixty-five (1765.0) feet to a stone monument at the westerly side of said Westfield-West Granville highway, thence southerly along said highway about thirteen hundred twenty (1320.0) feet to the place of beginning, containing about fifty and three tenths (50.3) Acres.

The foregoing described tracts are supposed to belong to David L Roach, Estate of Granville.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of (S. A. Allen
(L. W. Hildreth
(
Water Commissioners (____________

In the presence of



WESTFIELD WATER WORKS
Granville Supply
MAP OF LAND TAKEN
A.J. BRUCH HEIRS
SCALE: 1 inch = 200 feet.
JOHN L. HYDE C.E.
1917

A. J. Bruch

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts, in the year eighteen hundred and ninety-five, the Town of West - 'eld was authorized, for the purpose of providing an ad- tional supply of water for the use of said Town and its nhabitants, to, from time to time, take and hold, by pur- hase or otherwise, any lands, property, rights of way and asements that may be necessary or proper for holding,stor- g,conveying, distributing and preserving the purity of any the waters, taken or held by it under the provisions of Act,and for effectually carrying out the objects of said

Now, Therefor, Know All Men By These Presents, that the id Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions f said Act, has, on this fifth day of June in the year nineteen hundred and seventeen, taken, appropriated and now holds he land and property hereinafter described together with any nd all rights of way and easements which, in anywise thereto ppertain or belong.

Said lands and property are situated in Granville in aid County of Hampden, and are described as follows:-

Tract #1. Commencing at a stone monument on the westerly ide of the old Granville road at the northeasterly corner f land of Martin Peterson, thence North 66 o8' West about hree hundred seventy-two (372) feet to a stone monument, hence North 52 West about three hundred sixty (360) feet o a stone monument, thence North 20 52' East about eight undred thirty-five (835) feet to a stone monument, thence orth 66 32' West about nine hundred three (903) feet to a tone monument, thence North 1 07' East about four hundred ighty-five (485) feet to a stone monument at land of the own of Westfield, formerly of Michael Leahey, the preceding courses are along land of said Peterson, thence South 5 59'30" East along land of said Town about one thousand eventy-eight and two tenths (1078.2) feet to a stone monuent on the westerly side of said Granville road, thence outherly along said road about nineteen hundred sixty 1960) feet to the place of beginning, containing about hirty-two and five tenths (32.5) acres.

Tract #2. Commencing at a stone monument on the easterly ide of said Granville road at the southwesterly corner of and of the Town of Westfield, formerly of W. J. Leahey, hence North 87 37' East along land of said Town about three undred thirteen and two tenths (313.2) feet to a stone monment on the bank of the Hollister Brook at land of said own, formerly of Sarah E. Hollister, thence southeasterly own said brook about twelve hundred ninety (1290) feet to he old road leading easterly from the Granville road oppsite the dwelling of said Peterson, thence southerly and westerly along said road about eleven hundred (1100) feet to the Granville road, thence northerly along said Granville oad about fourteen hundred forty (1440) feet to the place f beginning, containing about fifteen (15) acres.

The foregoing described tracts are supposed to belong to he Heirs of A. J. Bruch of Granville.

In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of

Water Commissioners

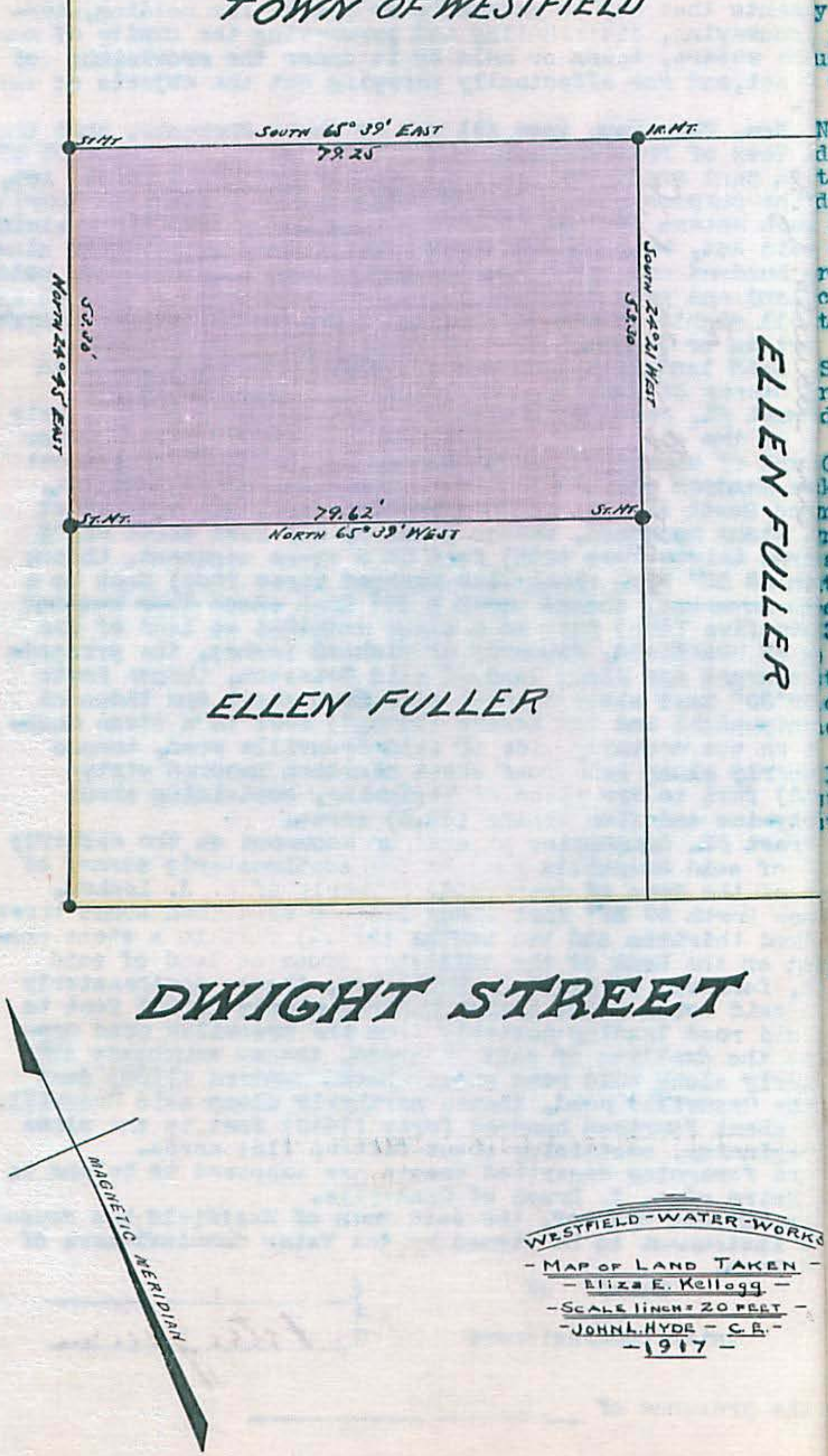
H. C. Lane

Peter Jensen

12237

the presence of John L. Hyde

HAMPDEN CO. REGISTRY OF DEEDS
RECEIVED AND RECORDED
JUL 9 1917
AT 9 OC. 20 M. A M


TOWN OF WESTFIELD
St.Mt.
SOUTH 65° 39' EAST
79.25
Ir.Mt.
SACKETT STREET
NORTH 24° 45' EAST
53.30'
SOUTH 24°21' WEST
53.30
ELLEN FULLER
St.Mt.
79.62'
NORTH 65° 39' WEST
St.Mt.
ELLEN FULLER
DWIGHT STREET
MAGNETIC MERIDIAN
WESTFIELD-WATER-WORKS
- MAP OF LAND TAKEN -
- Eliza E. Kellogg -
- SCALE 1 INCH = 20 FEET -
- JOHN L. HYDE - C.E. -
- 1917 -

Eliza E. Kellogg.

Whereas, by Chapter 342 of the Acts passed by the General urt of Massachusetts, in the year 1895, the Town of Westfield s authorized, for the purpose of providing an additional sup- y of water for the use of said Town and its inhabitants, to, om time to time, take and hold, by purchase or otherwise, any nds, property, rights of way and easements that may be neces- ry or proper for holding, storing, conveying, distributing d preserving the purity of any of the waters taken or held by under the provisions of said Act, and for effectually carry- g out the objects of said Act:-

Now, Therefore, KNOW ALL MEN BY THESE PRESENTS, that the id Town of Westfield, by virtue of, and in part execution the powers conferred by said Act, and for the purpose of lding, storing, and preserving the purity of such waters, d for effectually carrying out the provisions of said Act, s on this fourth day of September in the year 1917, taken, propriated and now holds the land and property hereinafter scribed, together with any and all rights of way and ease- nts which in any way thereto appertain or belong.

Said land and property are bounded and described as follows:- ing owned by Eliza E. Kellogg, of said Westfield, and situ- ed on Sackett Street, in said Westfield:-

Commencing at a stone monument in the easterly line of ckett Street at the southwesterly corner of land of the wn of Westfield, thence South 65° 39' East along land of said wn seventy-nine and twenty-five one-hundredths (79.25) feet an iron monument at land of Mrs. Ellen Fuller, thence uth 24° 21' West along land of said Fuller fifty-three and ree tenths (53.3) feet to a stone monument, thence North 39' West along land of said Fuller seventy-nine and sixty- o one-hundredths (79.62) feet to a stone monument in the sterly line of said Street, thence North 24° 45' East along id Street fifty-three and three tenths (53.3) feet to the ace of beginning.

IN WITNESS WHEREOF the said Town of Westfield has caused this strument to be signed by the Water Commissioners of said stfield.

H. C. Lane) BOARD OF
) WATER
Peter Jensen) COMMISSIONERS.

presence of:-

15954

HAMPDEN CO REGISTRY OF DEEDS
RECEIVED AND RECORDED
SEP 24 1917
AT 10 O'C 45 M a M

✓

157674

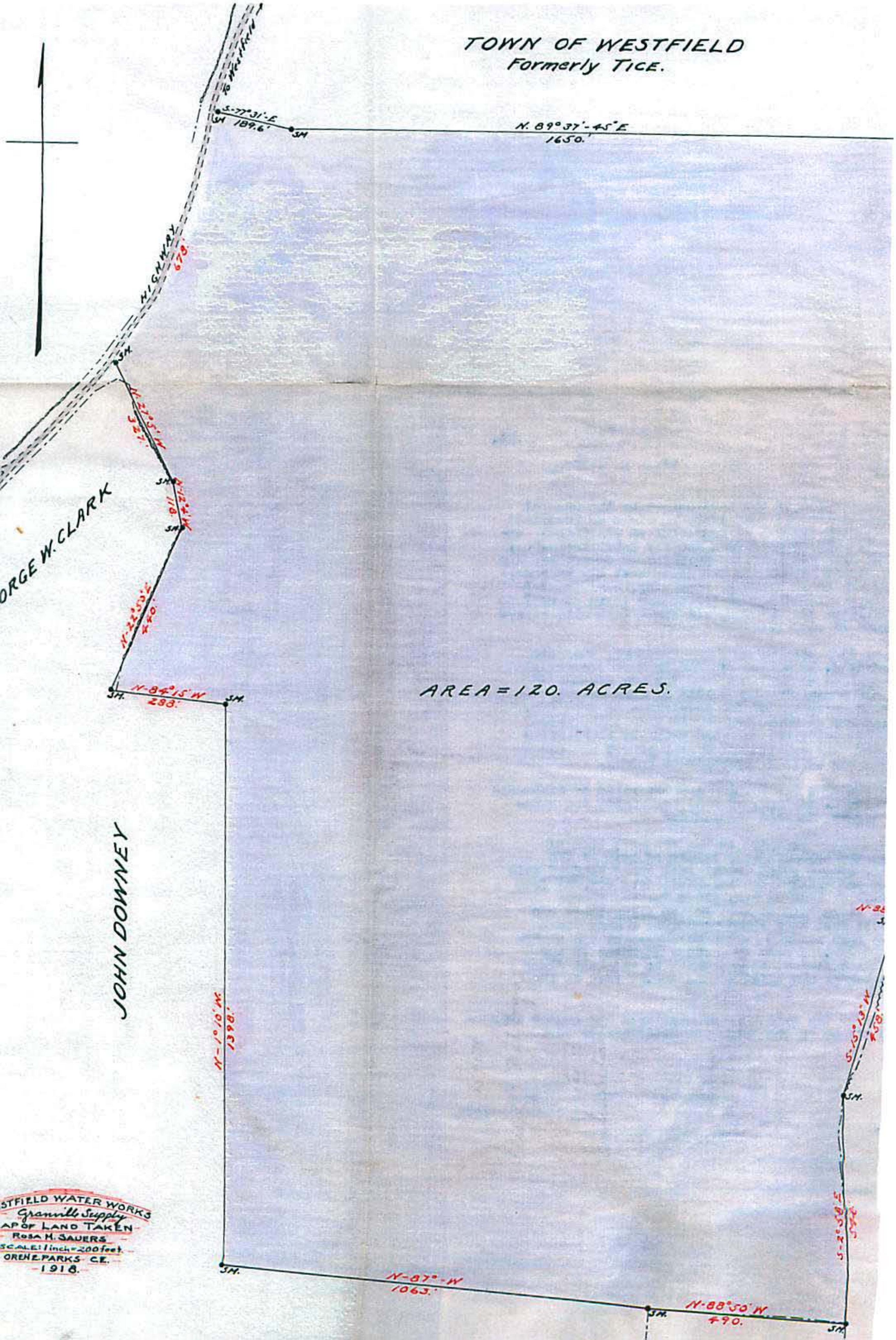
Eliza E. Kellogg

to

Inhabitants of

Westfield

HAMPDEN CO. REG[illegible]
RECEIVED AND RECORDED
SEP 24 1917
AT 10 OC 45 M a

TOWN OF WESTFIELD
Formerly TICE.
To Westfield
S-77°31'-E
189.6'
SM
SM
N. 89°37'-45"E
1650.'
HIGHWAY
678.'
SM
N-27°5'-W
327.'
SM
N-12°4'-W
118.'
SM
N-22°53'-E
440.'
SM.
N-84°15'-W
288.'
SM.
ORGE W. CLARK
AREA = 120. ACRES.
JOHN DOWNEY
N-1°10'-W.
1398.'
STFIELD WATER WORKS
Granville Supply
AP OF LAND TAKEN
ROSA H. SAUERS
SCALE: 1 inch = 200 feet.
OREN E. PARKS C.E.
1918.
SM.
N-87°-W
1063.'
SM.
N-88°50'W.
490.
SM.
S-2°58'E
532.
SM.
S-15°13'-W
458.
N-85
S

Granville Supply -

Sauers

Whereas, by Chapter three hundred and forty-two of the Acts passed by the General Court of Massachusetts, in the year eighteen hundred and ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters, taken or held by it under the provisions of said Act, and for effectually carrying out the objects of said Act:-

Now, Therefore, Know All Men By These Presents, that said Town of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters and for effectually carrying out the provisions of said Act, has, on this seventh day of December, in the year of nineteen hundred eighteen, taken, appropriated and now holds the land and property hereinafter described together with any and all rights of way and easements which, in anywise thereto appertain or belong.

Said lands and property are situated in Granville in said County of Hampden, and are described as follows:-

Commencing at a stone monument on the Easterly side of the highway at land of Town of Westfield, formerly of Dustin Tice; thence South 77° 31' East, about one hundred eighty-nine and six-tenths (189.6) feet to a stone monument; thence North 89° 37' 45" East, about sixteen hundred fifty (1650) feet to a stone monument; thence South 2° 36' 30" East about eight hundred seventy and nine-tenths (870.9) feet to a marked eighteen inch Yellow Birch tree; thence South 4° 08' 30" West about ten hundred fifty-two and nine-tenths (1052.9) feet to a stone monument at land of Seymour, the last four courses being along said land of Town of Westfield formerly of said Tice; thence North 88° 16' 45" West about eighty-five (85) feet to a stone monument; thence South 15° 13' West about four hundred fifty-eight (458) feet to a stone monument; thence South 2° 58' East about five hundred forty (540) feet to a stone monument; thence North 88° 50' West about four hundred ninety (490) feet to a stone monument at land of John Dugano, the last four courses being along land of said Seymour; thence North 87° 00' West about ten hundred sixty-three (1063) feet along land of said Dugano to a stone monument at land of John Downey; thenceNorth 1° 10' West about thirteen hundred ninety-eight (1398) feet to a stone monument; thence North 84° 15' West about two hundred eighty-eight (288) feet to a stone monument at land of George W. Clark, the last two courses being along land of said Downey; thence North 22° 50' East about four hundred forty (440) feet to a stone monument; thence North 12° 04' West about one hundred eighteen (118) feet to a stone monument; thence North 27° 05' West about three hundred twenty-seven (327) feet to a stone monument on the easterly side of said highway, the last three courses being along land of said Clark; thence along said highway about six hundred seventy-eight (678) feet to place of beginning; containing about one hundred twenty (120) acres.

The foregoing described tract is supposed to belong to Rosa M. Sauers and others, now or formerly of Granville.

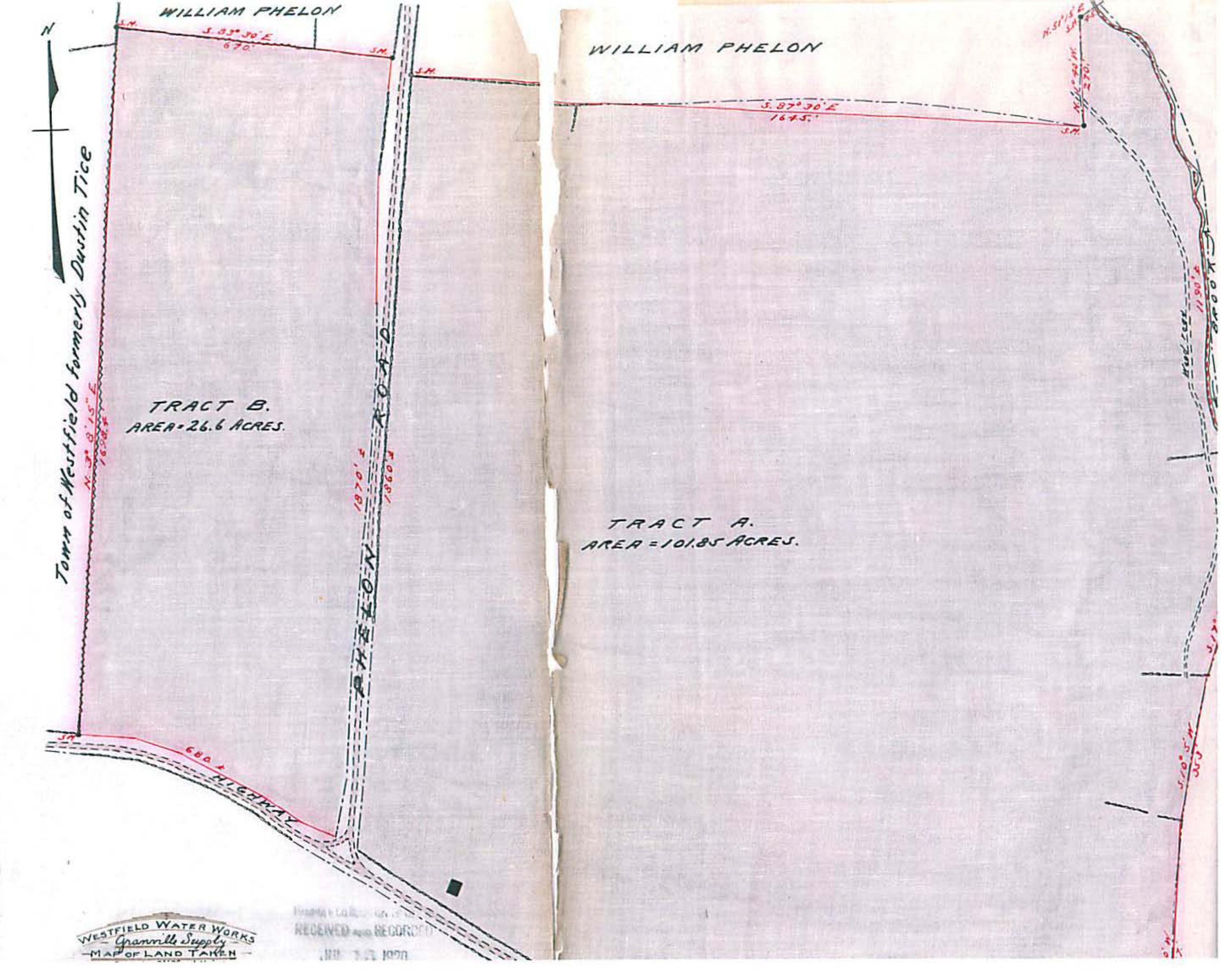
In Witness Whereof, the said Town of Westfield has caused this instrument to be signed by the Water Commissioners of said Town.

Board of
Water Commissioners
(H. C. Lane.
(Peter Jensen
(Edward G. Clark.

In the presence of Ann E. Parks

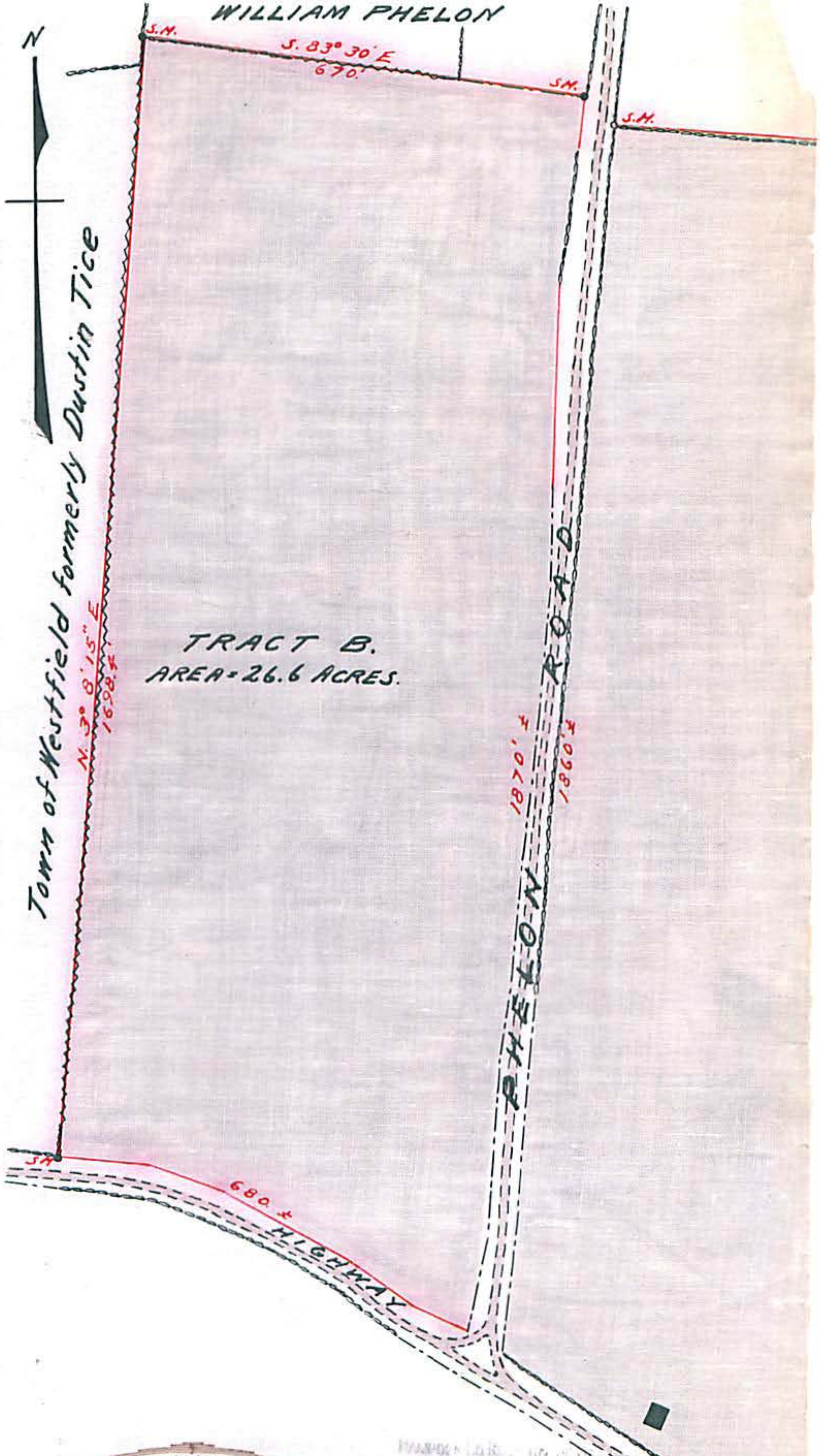
2695

[illegible]
RECEIVED AND RECORDED
MAR 7 1919
AT 3 OC 45 M P. M



WESTFIELD WATER WORKS
Granville Supply
MAP OF LAND TAKEN

RECEIVED and RECORDED
1920



WESTFIELD WATER WORKS
- Granville Supply -
- MAP OF LAND TAKEN -
- Dennis Clifford Heirs -
- SCALE: 1 inch = 200 feet -
- ORENE PARKS - C.E. -
- 1920 -

HAMPDEN [illegible]
RECEIVED AND RECORDED
JUL 23 1920
AT 2 O'C - M P M

Clifford

Whereas, by Chapter three hundred and forty-two of
e Acts passed by the General Court of Massachusetts,
the year eighteen hundred and ninety-five, the Town
Westfield was authorized, for the purpose of pro-
ding an additional supply of water for the use of said
wn and its inhabitants, to, from time to time, take
d hold, by purchase or otherwise, any lands, property,
ghts of way and easements that may be necessary or
oper for holding, storing, conveying, distributing and
reserving the purity of any of the waters, taken or
eld by it under the provisions of said Act, and for
ffectually carrying out the objects of said Act:-

Now, Therefore, Know **All Men** By These Presents,
hat said Town of Westfield, by virtue of, and in the
xercise of, and in part execution of the powers con-
ferred by said Act, for the purpose of holding, storing
nd preserving the purity of such waters and for
ffectually carrying out the provisions of said Act, has,
n this 1st day of July, in the year of nineteen hundred
wenty, taken, appropriated and now holds the land and
property hereinafter described together with any and all
rights of way and easements which, in anywise thereto
ppertain or belong.

Said lands and property are situated in the East
arish of Granville, in said County of Hampden, and are
escribed as follows:-

Tract A. Commencing at a stone monument on the
northerly side of the highway a little easterly of the
omestead of Dennis Clifford, at land of Town of West-
ield, formerly of Wilbur Pendleton; thence westerly
long said highway about twenty-one hundred (2100) feet
o Phelon Road, so-called; thence northerly along said
oad about eighteen hundred sixty (1860) feet to a stone
onument at land of William Phelon; thence South 87° 30' East
bout sixteen hundred forty-five (1645) feet to a stone
onument; thence North 1° 40' West about two hundred seventy
270) feet to a stone monument; thence North 51° 45' East
bout forty-five (45) feet to the center of a brook at
and of Town of Westfield, formerly of said Wilbur Pendleton,
he last three courses being along land of said William
helon; thence southerly along said brook about eleven
undred ninety (1190) feet; thence South 7° 23' East about
wo hundred forty (240) feet to a stone monument; thence
outh 17° 44' West about three hundred four (304) feet;
hence South 10° 05' West about three hundred fifty-three
353) feet; thence South 3° 30' West about five hundred
ixty-seven (567) feet to place of beginning, the last five
ourses being along land of Town of Westfield, formerly of
aid Wilbur Pendleton. Described tract contains about
ne hundred one and eighty-five one-hundredths (101.85) acres.

Tract B. Commencing at a stone monument on the northerly
ide of the highway at land of Town of Westfield, formerly of
ustin Tice; thence North 3° 08' 15" East along land formerly
f said Dustin Tice about sixteen hundred ninety-eight and four
enths (1698.4) feet to a stone monument at land of William
helon; thence South 83° 30' East along land of said William
elon about six hundred seventy (670) feet to a stone monument
the westerly side of Phelon Road, so called; thence
utherly along said road about eighteen hundred seventy (1870)
et to the first mentioned highway; thence westerly along
id highway about six hundred eighty (680) feet to place of
inning; containing about twenty-six and six-tenths (26.6)
res.

The foregoing described tract is supposed to belong
the Estate of Dennis Clifford, late of Westfield, for-
rly of Granville.

In Witness Whereof, the said Town of Westfield has
used this instrument to be signed by the Water Commis-
oners of said Town.

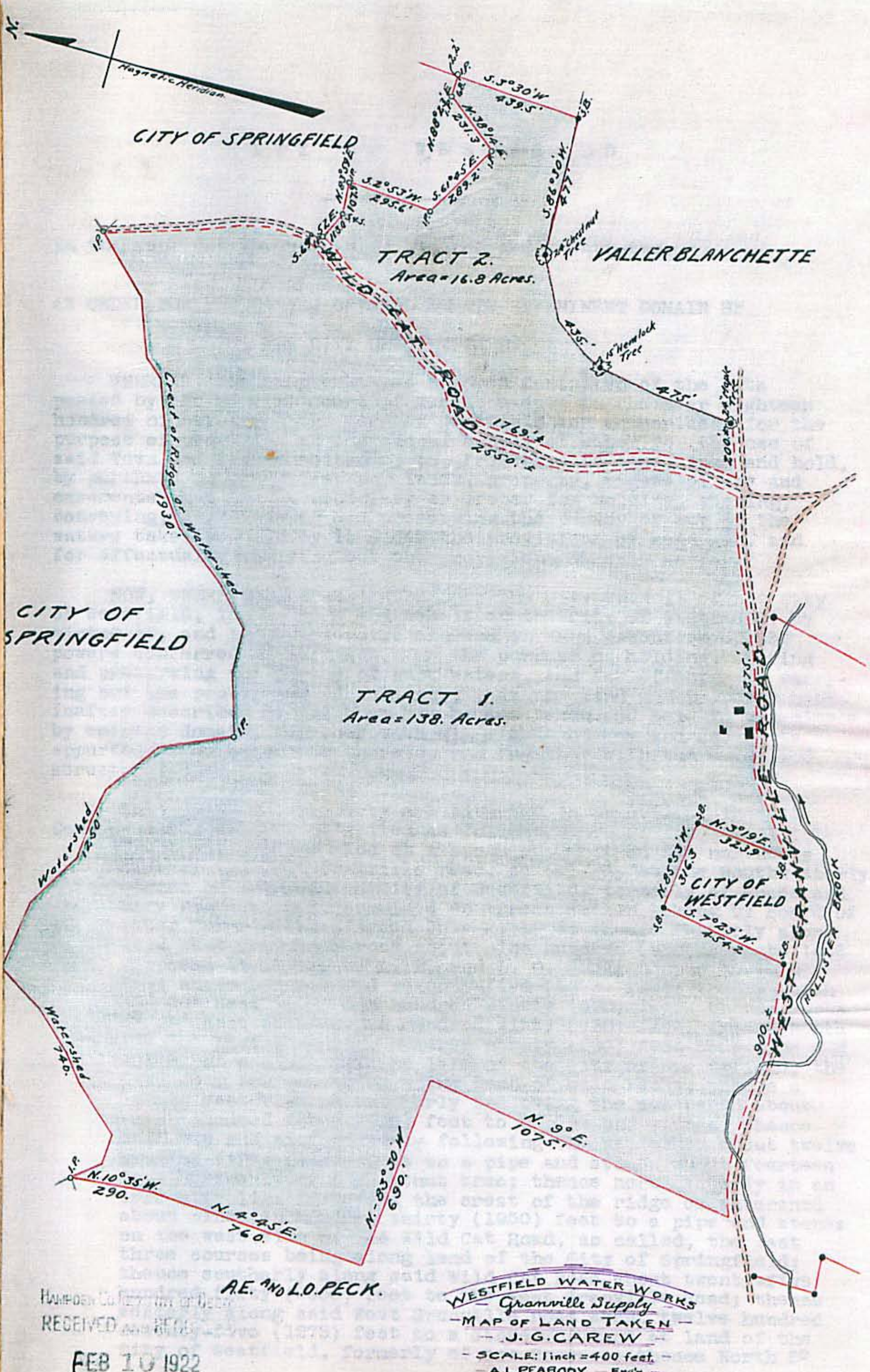
Board of
ater Commissioners

H. C. Lane.
Peter Jensen
Edward G. Clark

presence of Orrin E. Parks

16294

HAMPDEN CO REGISTRY OF DEEDS
RECEIVED AND RECORDED
JUL 15 1920
AT 2 O'C — M. P M.



WESTFIELD WATER WORKS
Granville Supply
MAP OF LAND TAKEN
J.G. CAREW
SCALE: 1 inch = 400 feet.
A.L. PEABODY Eng'r.
1922

HAMPDEN CO. REGISTRY OF DEEDS
RECEIVED AND RECD.
FEB 10 1922
AT 4 h. 05 m. P M

CITY OF WESTFIELD

In the year one thousand nine hundred and twenty-two.

AN ORDER FOR THE TAKING OF REAL ESTATE BY EMINENT DOMAIN BY THE CITY OF WESTFIELD.

WHEREAS, By chapter three hundred forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the provisions of said Act:-

NOW, THEREFORE, IT IS ORDERED by the City Council of the City of Westfield, in the name and behalf of the City of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing and preserving the purity of such waters, and for effectually carrying out the provisions of said Act, that the land and property hereinafter described be and they hereby are taken and held in fee-simple, by eminent domain, together with all rights of way and easements appurtenant or belonging thereto, and together with the trees and structures thereon.

Said lands and property are situated in Granville, in said Commonwealth, and are described as follows:-

Tract #1. Commencing at a stone monument on the northerly side of the West Granville road, so called, at the southwesterly corner of land of the City of Westfield, formerly of Moses and Mary Provost, and described as "Tract #2" in taking by Board of Water Commissioners dated July 2, 1906; thence westerly along said West Granville road about nine hundred (900) feet to land supposed to belong to A. E. and L. O. Peck; thence North 9° East about ten hundred seventy-five (1075) feet; thence North 83° 30' West about six hundred ninety (690) feet; thence North 4° 45' East about seven hundred sixty (760) feet; thence North 10° 35' West about two hundred ninety (290) feet to a pipe and stones at a wire fence at land of the City of Springfield; the last four courses being along land of said Pecks; thence a little easterly and northerly following the watershed about seven hundred forty (740) feet to a pipe and stones; thence easterly and southeasterly following the watershed about twelve hundred fifty (1250) feet to a pipe and stones about fourteen feet northerly of a Chestnut tree; thence northeasterly in an irregular line following the crest of the ridge or watershed about nineteen hundred thirty (1930) feet to a pipe and stones on the west side of the Wild Cat Road, so called, the last three courses being along land of the City of Springfield; thence southerly along said Wild Cat road about twenty-five hundred fifty (2550) feet to the West Granville Road; thence westerly along said West Granville road about twelve hundred seventy-five (1275) feet to a stone monument at land of the City of Westfield, formerly of one Provost; thence North 3°

19' East about three hundred twenty-three and nine tenths (323.9) feet to a stone monument; thence North 85° 53' West about three hundred sixteen and three tenths (316.3) feet to a stone monument; thence South 7° 23' West about four hundred fifty-four and two tenths (454.2) feet to place of beginning, the last three courses being along land of the City of Westfield, formerly of Moses and Mary Provost. The aforedescribed tract contains about one hundred thirty-eight (138) acres.

Tract #2. Commencing at an iron pipe and stones on the easterly side of the Wild Cat road at land of the City of Springfield; thence South 69° 52' East about one hundred thirteen (113) feet to a stake and stones; thence North 83° 59' East about one hundred seven and nine tenths (107.9) feet to an iron pipe and stones; thence South 2° 53' West about two hundred ninety-five and six tenths (295.6) feet to an iron pipe and stones; thence South 61° 45' East about two hundred eighty nine and two tenths (289.2) feet to an iron pipe and stones; thence North 38° 14' East about two hundred thirty-one and three tenths (231.3) feet to an iron pipe and stones; thence North 88° 23' East about sixty-eight (68) feet to a point bearing South 88° 23' West two and two tenths (2.2) feet from an iron pipe and stones; thence South 3° 30' West about four hundred thirty-nine and five tenths (439.5) feet to a stone monument at land supposed to belong to Valler Blanchette; the preceeding courses being along land of said City of Springfield; thence South 86° 30' West about four hundred seventy-seven (477) feet to a twenty-four (24) inch Chestnut tree; thence southwesterly along a fence about four hundred thirty-five (435) feet to a fifteen (15) inch Hemlock tree; thence southerly along a fence about four hundred seventy-five (475) feet to a twenty-four (24) inch Maple tree on the northerly side of an old highway, the last three courses being along land of said Blanchette; thence westerly along said old highway about two hundred (200) feet to a point on the easterly side of the Wild Cat road, thence northerly along said Wild Cat road about seventeen hundred sixty-nine (1769) feet to place of beginning, containing about sixteen and eight tenths (16.8) acres.

The foregoing described tracts are supposed to belong to Justin G. Carew of Monson, Mass.

PRESENTED TO THE MAYOR

FOR APPROVAL February 4th, 1922,

Florence W. Burke,
City Clerk

APPROVED BY THE MAYOR

February 4th, 1922,

Geo. W. Searle,
Mayor

The foregoing is a true copy of an order unanimously passed through all its stages of legislation under suspension of the rules by the City Council of the City of Westfield, Massachusetts, on the 2nd day of February, 1922, and of the indorsement of the City Clerk and the approval of the Mayor thereon.

ATTEST:

Florence W. Burke
City Clerk

2545

HAMPDEN CO. REGISTRY OF DEEDS
RECEIVED AND RECORDED
FEB 10 1922
AT 1 O'C 05 M P M

145

A. E. & L. O. Peck

7835

Hampden Co. Registry of Deeds
RECEIVED AND RECORDED
APR 25 1922
AT 3 OC 35 M P M

CITY OF WESTFIELD

In the year one thousand nine hundred and twenty-two.

AN ORDER FOR THE TAKING OF REAL ESTATE BY EMINENT DOMAIN BY THE CITY OF WESTFIELD.

WHEREAS, By chapter three hundred forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the provisions of said Act:-

NOW, THEREFORE, IT IS ORDERED by the City Council of the City of Westfield, in the name and behalf of the City of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing, and preserving the purity of such waters, and for effectually carrying out the provisions of said Act, that the land and property hereinafter described be and they hereby are taken and held in fee-simple, by eminent domain, together with all rights of way and easements appurtenant or belonging thereto, and together with the trees and structures thereon.

Said lands and property are situated in Granville, in said Commonwealth and are described as follows:-

Commencing at a point on the northerly side of the West Granville Road, so called, at land of the City of Westfield, formerly of J. G. Carew; thence westerly along said road about thirteen hundred seventy-five (1375) feet to a stone monument at land supposed to belong to M. E. Arnold; thence North 5° 40' East about sixteen hundred sixty-five (1665) feet to a stone monument; thence South 89° 30' West about one hundred ninety (190) feet to a stone monument; thence North 7° 50' East about ten hundred eighty-five (1085) feet to an iron monument at land of the City of Springfield, the last three courses are along land supposed to belong to said Arnold; thence easterly along land of said City of Springfield about six hundred sixty (660) feet to an iron monument at land of the City of Westfield, formerly of said J. G. Carew; thence South 10° 35' East about two hundred ninety (290) feet; thence South 4° 45' West about seven hundred sixty (760) feet; thence South 83° 30' East about six hundred ninety (690) feet; thence South 9° 00' West about ten hundred seventy-five (1075) feet to place of beginning, the last four courses are along land of the City of Westfield, formerly of J. G. Carew. The afore described tract of land contains about 60.9 acres and is supposed to belong to A. E. and L. O. Peck.

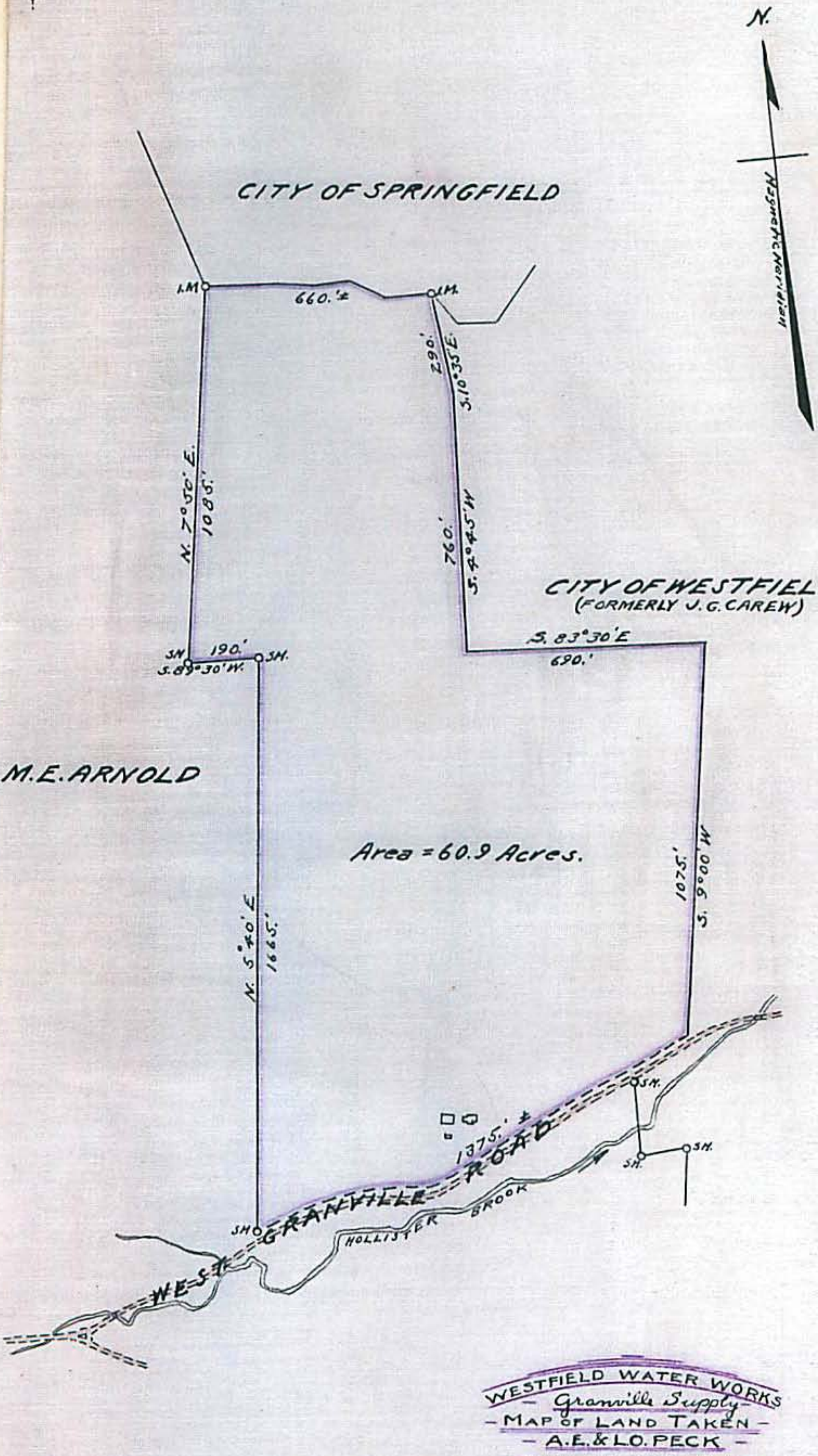
Westfield, Massachusetts, April 21, 1922.

The foregoing is a true copy of an order passed through all its stages of legislation by unanimous consent under suspension of the rules by the City Council of the City of Westfield, Mass., April 10, 1922, and of the indorsement of the City Clerk and approval of the Mayor thereon.

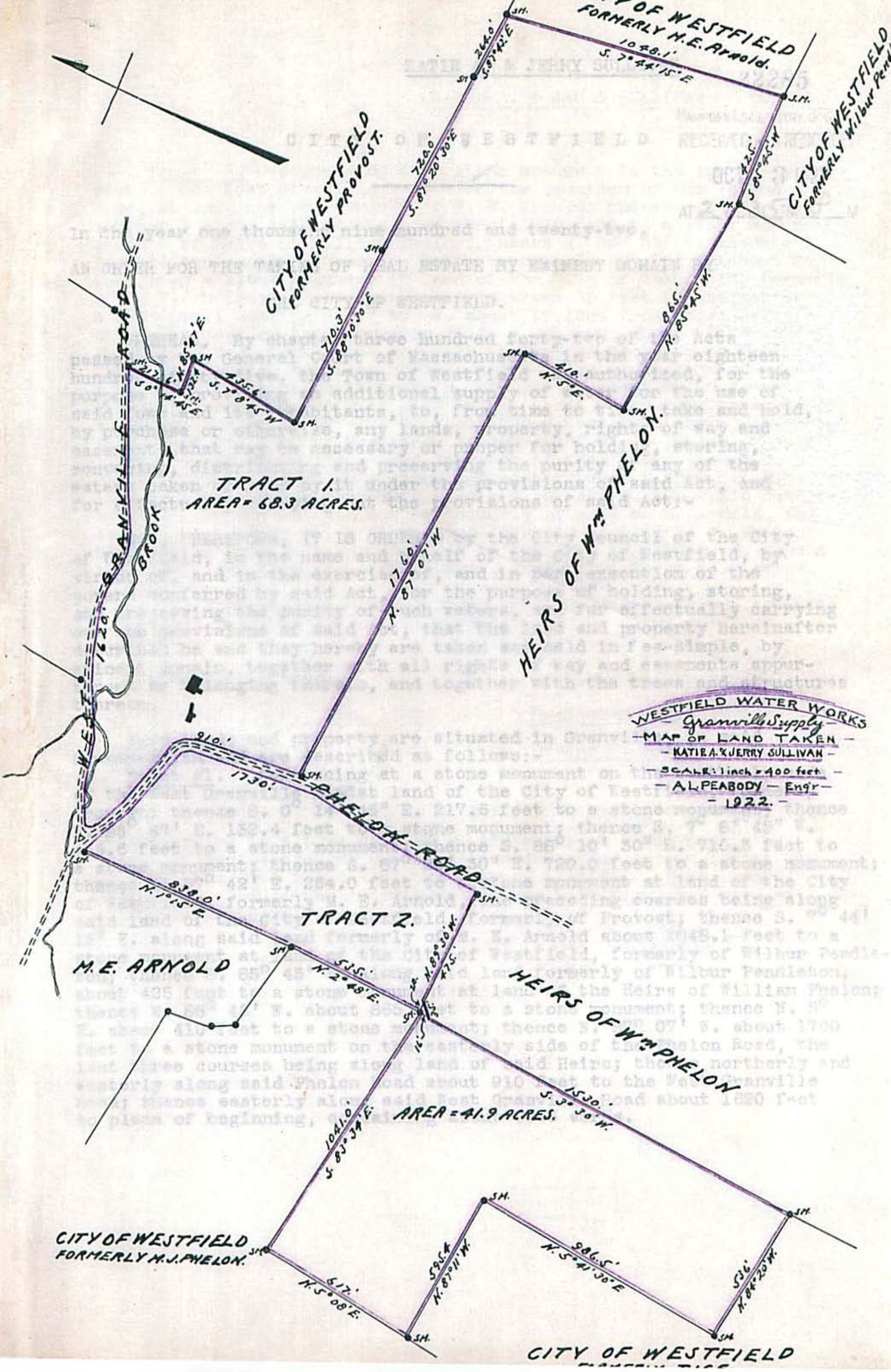
Attest: Florence W. Burke City Clerk.

Presented to the Mayor
For approval...April 20......1922.....
.........Florence W. Burke.......
City Clerk

APPROVED BY THE MAYOR
April 20 1922
George W. Searle



WESTFIELD WATER WORKS
- Granville Supply -
- MAP OF LAND TAKEN -
- A.E. & L.O. PECK -
- SCALE: 1 inch = 400 feet. -
- A.L. PEABODY - Engr -
- 1922 -


WESTFIELD WATER WORKS
- Granville Supply -
- MAP OF LAND TAKEN -
- KATIE A. & JERRY SULLIVAN -
- SCALE: 1 inch = 400 feet -
- A.L. PEABODY - Eng'r -
- 1922. -
CITY OF WESTFIELD
FORMERLY H.E. Arnold.
1048.1'
S. 7°44'15"E.
264.0'
S. 8°1'42"E.
CITY OF WESTFIELD
FORMERLY Wilbur Pendleton
425'
S. 85°45'W.
CITY OF WESTFIELD
FORMERLY PROVOST.
720.0'
S. 87°20'30"E.
710.3'
S. 88°10'30"E.
S.H.
217.6'
S. 0°14'45"E.
132.4'
N. 85°47'E.
435.6'
S. 7°8'45"W.
865'
N. 85°45'W.
410'
N. 5°E.
TRACT 1.
AREA = 68.3 ACRES.
BROOK
WEST GRANVILLE ROAD
1620'
HEIRS OF Wm. PHELON
1760'
N. 87°07'W.
910'
1730'
PHELON ROAD
838.0'
N. 1°15'E.
TRACT 2.
M.E. ARNOLD
535'
N. 2°48'E.
N. 89°30'W.
475'
HEIRS OF Wm. PHELON
1530'
S. 3°30'W.
AREA = 41.9 ACRES.
1041.0'
S. 83°34'E.
CITY OF WESTFIELD
FORMERLY M.J. PHELON.
617'
N. 5°08'E.
595.4'
N. 87°11'W.
986.5'
N. 5°41'30"E.
536'
N. 84°20'W.
CITY OF WESTFIELD

KATIE A. & JERRY SULLIVAN

22285

HAMPDEN CO. REGISTRY OF DEEDS
RECEIVED AND RECORDED
OCT 3 1922
AT 2 O'C 35 M P M

CITY OF WESTFIELD

In the year one thousand nine hundred and twenty-two.

AN ORDER FOR THE TAKING OF REAL ESTATE BY EMINENT DOMAIN BY THE CITY OF WESTFIELD.

WHEREAS, By chapter three hundred forty-two of the Acts passed by the General Court of Massachusetts in the year eighteen hundred ninety-five, the Town of Westfield was authorized, for the purpose of providing an additional supply of water for the use of said Town and its inhabitants, to, from time to time, take and hold, by purchase or otherwise, any lands, property, rights of way and easements that may be necessary or proper for holding, storing, conveying, distributing and preserving the purity of any of the waters taken or held by it under the provisions of said Act, and for effectually carrying out the provisions of said Act:-

NOW, THEREFORE, IT IS ORDERED by the City Council of the City of Westfield, in the name and behalf of the City of Westfield, by virtue of, and in the exercise of, and in part execution of the powers conferred by said Act, for the purpose of holding, storing, and preserving the purity of such waters, and for effectually carrying out the provisions of said Act, that the land and property hereinafter described be and they hereby are taken and held in fee-simple, by eminent domain, together with all rights of way and easements appurtenant or belonging thereto, and together with the trees and structures thereon.

Said lands and property are situated in Granville, in said Commonwealth and are described as follows:-

Tract #1. Commencing at a stone monument on the southerly side of the West Granville Road at land of the City of Westfield, formerly Provost: thence S. 0° 14' 45" E. 217.6 feet to a stone monument; thence N. 85° 47' E. 132.4 feet to a stone monument; thence S. 7° 8' 45" W. 435.6 feet to a stone monument; thence S. 88° 10' 30" E. 710.3 feet to a stone monument; thence S. 87° 20' 30" E. 720.0 feet to a stone monument; thence S. 87° 42' E. 264.0 feet to a stone monument at land of the City of Westfield, formerly M. E. Arnold, the preceding courses being along said land of the City of Westfield, formerly of Provost; thence S. 7° 44' 15" E. along said land formerly of M. E. Arnold about 1048.1 feet to a stone monument at land of the City of Westfield, formerly of Wilbur Pendleton; thence S. 85° 45' W. along said land formerly of Wilbur Pendleton, about 425 feet to a stone monument at land of the Heirs of William Phelon; thence N. 85° 45' W. about 865 feet to a stone monument; thence N. 5° E. about 410 feet to a stone monument; thence N. 87° 07' W. about 1760 feet to a stone monument on the easterly side of the Phelon Road, the last three courses being along land of said Heirs; thence northerly and westerly along said Phelon Road about 910 feet to the West Granville Road; thence easterly along said West Granville Road about 1620 feet to place of beginning, containing about 68.3 acres.

Tract #2. Commencing at a stone monument on the southerly side of the West Granville Road near the junction of the Phelon Road, at land now or formerly of M. E. Arnold; thence easterly and southerly along said Phelon Road about 1730 feet to a stone monument at land of Heirs of William Phelon; thence N. 89° 30' W. about 475 feet to the corner of a stone wall, bearing S. 89° 30' E. about 20 feet from a stone monument at land of the City of Westfield, formerly of M. J. Phelon; thence southwesterly about 35 feet to the corner of a stone wall bearing S. 3° 30' W. about 16 feet from above described stone monument at land formerly of M. J. Phelon; thence S. 3° 30' W. about 1530 feet to a stone monument at land of the City of Westfield, formerly of Tice, the last three courses being along land of said Heirs of William Phelon; thence N. 84° 20' W. about 536.0 feet to a stone monument; thence N. 5° 41' 30" E. about 986.5 feet to a stone monument; thence N. 87° 11' W. about 595.4 feet to a stone monument at land of the City of Westfield, formerly of M. J. Phelon, the last three courses being along land formerly of said Tice; thence N. 5° 08' E. about 617 feet to a stone monument; thence S. 83° 34' E. about 1041 feet to a stone monument; thence N. 2° 48' E. about 535 feet to a stone monument at land now or formerly of said M. E. Arnold, the last three courses being along land formerly of said M. J. Phelon; thence N. 1° 15' E. along land now or formerly of said M. E. Arnold about 838 feet to place of beginning, containing about 41.9 acres.

The foregoing described tracts are supposed to belong to Katie A. & Jerry Sullivan of Granville, Mass.

Presented to the Mayor	Approved by the Mayor
For approval Sept. 25th, 1922.	September 25th, 1922
Harold Whittemore, City Clerk	George W. Searle, Mayor

Westfield, Mass., Sept. 25, 1922.

The foregoing is a true copy of an order passed through all its stages of legislation by unanimous consent under suspension of the rules by the City Council of the City of Westfield, Mass., Sept. 21st, 1922, and of the indorsement of the City Clerk and approval of the Mayor thereon.

Attest: Harold Whittemore
City Clerk.

End of Book D21 ~ Dams ~ Westfield